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# MINOR SURGERY.

# MINOR SURGERY;

OR,

# HINTS

ON THE

# EVERY-DAY DUTIES OF THE SURGEON.

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April 17th
1851

BY

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OF PENNSYLVANIA;
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TO THE

MEDICAL CLASS

OF THE

UNIVERSITY OF PENNSYLVANIA

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BY THEIR FRIEND, THE

AUTHOR.

# PREFACE

## TO THE THIRD EDITION.

In the former editions of this volume, some of the points referred to seemed of such simplicity, that considerable doubt existed in my mind as to the propriety of their consideration, presuming that every student would be familiar with their details. Experience, however, has demonstrated that it is in the very simplest matters that the young practitioner soonest hesitates, his collegiate studies instructing him rather in the weightier matters of the law than in those of less importance.

Believing, also, that the value of the original plan has been sufficiently tested by the fact, that two large editions of near five thousand copies have been rapidly exhausted, notwithstanding the publication of other meritorious works of a similar kind, it has been deemed best to adhere to the elementary character heretofore sustained by this volume, and to present it a third time, to those for whom it has been written, as especially adapted to their earliest professional wants.

In the present edition I have, therefore, in nowise changed the former arrangement, but have simply revised and amended the text in accordance with the improvements of the day. Many new subjects of a similar elementary nature have, however, been added, in order to furnish the younger practitioners, and especially those who have not enjoyed the advantages of a residence in a hospital, with further practical details on matters of common occurrence.

Pursuing the original object of furnishing "Hints on the Every-Day Duties of the Surgeon," the new matter will be found to be very briefly stated, and the operative directions given in as condensed a form as was compatible with accurate description. The Duties of Assistants in Operations, the Mode of conducting Etherization, the Mechanical Treatment of Club Feet, the Cure of Aneurism by Compression, the Catoptric Diagnosis of Cataract, and similar subjects, likely to prove of daily utility to the general practitioner, are among the principal additions; their comprehension being aided by appropriate illustrations, as far as seemed needful.

Within the few years that have elapsed since the publication of the first edition, "Minor Surgery" has gained a degree of attention that has materially changed the estimate of its general value; and many who have found its practical importance, now regard it as a most valuable portion of a medical education. Should the present volume tend to maintain this opinion, and prove useful to that portion of the Profession for whom it is especially intended, it will accomplish all that has been desired for it.

HENRY H. SMITH.

120 S. Ninth Street,
Philadelphia.

# LIST OF AUTHORS.

The following list embraces the authors consulted in connection with the present subject:—

Amesbury, on Fractures.
J. Rhea Barton, North American Journal, &c.
Boyer, Maladies Chirurgicales.
Bourgery, Minor Surgery, by Kissam.
Bond, North American Medical Journal.
Baynton, on Ulcers.
Sir Astley Cooper, on Dislocations and Fractures.
Samuel Cooper, Dictionary.
Chelius, Surgery, by South and Norris.
Coster, Manual of Operative Surgery.
Cutler, on Bandages.
R. Coates, Journal of Medical Sciences.
Dorsey, Elements of Surgery.
Dessault's Surgery, by Caldwell.
Druit, Modern Surgery, by Sargent.
Dupuytren, Leçons Orales.
Ferguson, Surgery, by Norris.
Gerdy, Bandages et Pansements.
Gibson, Insitutes and Practice of Surgery.
Goddard, on the Teeth.
Jamain, Petite Chirurgic.
Philadelphia Journal of Pharmacy.
Lawrence on the Eye, by Hays.
Liston, Elements of Surgery, by Gross.
Medical Examiner, 1837–38.
Mayor, Bandages et Appareils.
Malgaigne, Médecine Opératoire.
Pancoast, Operative Surgery.
Pott, Chirurgical Works.
Rankins Abstract.
Sedillot, Médecine Opératoire.
N. R. Smith, Baltimore Medical and Surgical Journal
Thillaye, Traité des Bandages.
Velpeau, Médecine Opératoire.
Warren, on Ether.

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# MINOR SURGERY.

## INTRODUCTION.

The daily duties required of the surgeon call for such varied qualifications, not only in his natural temperament but also in that which is acquired by education, that comparatively few of the great mass of medical men are physically fitted for their performance, or have any inclination to undertake them. The physician, therefore, generally avoids those exciting and dangerous scenes which the coolness and nerve of the surgeon alone are capable of directing; and passes through life in the more quiet, though not less responsible occupation, of combatting disease in its more insidious invasions.

The necessities of his patients, and the wide extent over which he has to travel, not unfrequently, however, compel him to combine within himself the functions of both branches of medicine; and, though avoiding great operations, to resort to means as purely operative as those requiring the extensive use of the knife. On this account, Surgery has from an early period been divided by most writers into two portions, — one termed Minor Surgery, including bleeding, leeching, &c., the other designated as Major Surgery, and embracing capital operations. Such a division is, however, so purely conventional, that there has always been a diversity of sentiment in regard to the limits of each department; some giving to Minor Surgery the smallest possible amount, whilst others, failing to recognise its existence, include all the surgeon's duty under one general head.

Without intending to settle this long-disputed point, I shall, in the following pages, designate as Minor Surgery, all such duties as every practitioner should be able to perform; and as these acts are generally regarded by operators as of little importance compared with their more hazardous operations, the term appears, in this light, to be sufficiently appropriate.

Although the title thus chosen would seem to designate that the duties referred to are of a trivial character, yet it will soon be seen that they are so only in appearance. In general practice, Minor Surgery is not less important to a practitioner than that department endowed with a more pompous title to a surgeon. Both require a large amount of information; both involve very materially the comfort of the patient; whilst any of the minor operations may produce death, the application of a leech having proved fatal, and bleeding, bandaging, &c., improperly performed, having caused the loss of limbs as certainly as the more serious operation of amputation.

To the general practitioner Minor Surgery is the more valuable of the two divisions. An important operation may be avoided, a minor one must be performed: a major operation in many sections of the country is a rare event, a minor one of hourly occurrence. It should, therefore, receive at his hands that attention to which from its daily calls it is justly entitled.

In the consideration of the subject five divisions naturally present themselves, and I shall place them in the order in which they can be most advantageously studied:—1st. Dressings and Bandages. 2d. Handkerchief Bandages and Provisional Dressings. 3d. Apparatus for Fractures. 4th. Apparatus for Dislocations, and 5th. Daily or Minor Operations.

# PART FIRST.

## CHAPTER I.

### ON THE PREPARATION AND APPLICATION OF DRESSINGS.

ALTHOUGH very varied information and skill are necessary for the proper treatment of surgical injuries, and especially those requiring the performance of operations, yet will the success likely to ensue depend in a great degree upon the attention subsequently given to the case. The art of dressing becomes, therefore, a subject of equal, if not greater importance, than that of operating, and should be regarded as a matter of vital consequence, as without it all other means would often prove unavailing.

The object of all dressings being the relief of injured parts, their application must of course depend upon circumstances. As a general rule, dressings are intended to preserve injured parts in proper coaptation; unite them, or prevent their too hasty union; shelter them from the action of the atmosphere or of external injuries; absorb discharges; prevent dessication of surface; and last, though not least, ensure cleanliness. DRESSINGS may, therefore, be defined as those portions of different substances applied with such intentions directly to operated or injured surfaces.

The different articles employed, and the means by which they are to be applied, are known under the general head of APPARATUS OF DRESSING. This consists of two parts, one containing the *Instruments for Dressing*, the other the *Pieces of Dressing* to be applied.

The INSTRUMENTS FOR DRESSING must vary according to the nature of the case, but usually they may be limited to such as are generally found in the assemblage furnished by the cutlers, and known under the name of the Pocket Case. This, if required for general use, should contain Dressing or Ring Forceps; Simple Forceps; Scissors, both straight and curved; Probes; Directors; Spatulæ; Bistouries; Abscess-Lancets; one male and female Catheter; a Porte Caustic; a Tenaculum; Straight and Curved Needles; Ligatures; and often such others as the taste of the cutler or his interests may lead him to select. Under this head, also, the surgeon should, in serious cases, include Razors, Basins, Sponges, Towels, Buckets, &c.; in fact, all that is requisite for the preparing of a part for the application of a dressing, or the removal of the previous one.

As the proper use of the instruments just referred to is not always known by those purchasing them, a brief description of the objects and method of handling each may not be out of place.

The DRESSING FORCEPS are employed for removing the different pieces of dressing, not only in order to protect the fingers of the surgeon from discharges that are often very irritating, but also on account of their enabling him to seize them with less risk of injury to surrounding parts, especially by pressure. In cases of fistulæ or sinuses they are also often necessary, in order to cleanse the bottom of the sinus, or remove deep-seated portions of dressing, or other foreign matter. In using them, the thumb and second finger are to be passed through the rings of the handle, and the fore-finger extended towards the joint of the blades, in order to render them more firm.

The SIMPLE OR DISSECTING FORCEPS may be frequently substituted for the Dressing Forceps, especially where minute portions of dressing, such as ligatures, &c., are to be removed. They are, however, more frequently used for seizing such portions of integument as may require to be cut off by the knife or scissors. As similar forceps are employed by each student in dissection, no information need be here given as to the manner of using them.

The STRAIGHT SCISSORS are employed in dressing, for the ordinary purposes of scissors; but those which are CURVED, either on the side or front, are mainly required to facilitate the removal of such dressings as adhere closely to the body; as adhesive strips, bandages, &c., especially where it is desirable to remove them without deranging the position of the part. Scissors are also occasionally used for excision of portions of integuments, as in hair-lip; but they do not answer as well as the scalpel for such operations, because they are apt to bruise the edges of the part divided, and thus interfere with its subsequent adhesion. If scissors have a rough edge and cut harshly, light pressure of the thick skin of the thumb along the blades will remove it.

PROBES are intended as substitutes for the fingers where the space to be examined is too narrow to admit a larger body. But where it is possible to introduce the finger it should always be preferred, on account of the greater accuracy of the touch. The probe should always be made of silver, or some equally flexible metal, in order that it may be readily bent, to suit the position of the part to be examined.

The DIRECTOR is a broad probe with a groove in it, which is generally used to direct the point of a scalpel or bistoury, in the division of deep-seated parts, especially where important organs are in the neighbourhood of the incision. Sometimes it is formed with a flat end for a handle, and sometimes it has a ring or other slight expansion to keep it from turning in the fingers of the operator. When the director is required to facilitate incisions, it should be held with the thumb on the top of the handle, and the fingers of the same hand beneath its shaft, in order to prevent its slipping out of place. The knife being held in the opposite hand, is then made to pass along the groove as far as may be desired.

The SPATULA requires but little description. It may be used either in spreading cerates, in the preparation of dressings, &c., or for removing such portions of similar substances as remain adherent to the skin.

BISTOURIES and SCALPELS are of various shapes, and should be selected mainly with reference to the probable wants of the practitioner. As their use varies much in the different operations to which they are applicable, the reader is necessarily referred to the works on Operative Surgery for any further information than will be found in Part Fifth of this volume.

ABSCESS LANCETS resemble the ordinary thumb-lancets, except that they are larger. The manner of using them will be referred to under the head of Operations.

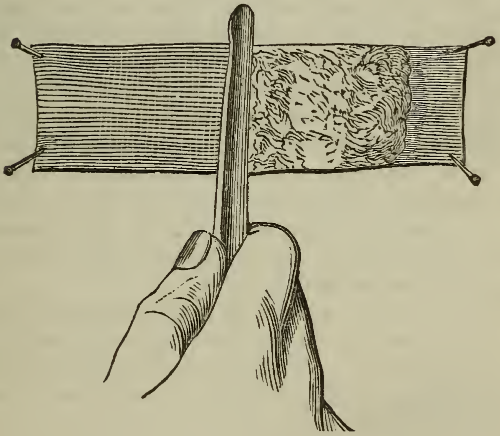
The PORTE-CAUSTIC or CAUSTIC HOLDER is employed as its name designates. It is usually armed with the Nitrate of Silver, or Lunar Caustic, and not with the caustic potash. As a general rule, the holder should be made of silver, with platina ends, as this metal is not acted upon by the caustic, whereas bone or similar substances, of which it is sometimes formed, are soon destroyed. When it is desirable in arming the holder to give the caustic a fine point, so as to enable us to touch only small spots, as in the treatment of ulcerated cornea, chancre, &c., it will be best accomplished by rubbing the caustic with a piece of wet rag, so as to wear it away, rather than by scraping, as the brittleness of the nitrate of silver renders it difficult to bring it to a point merely by the use of the knife.

The STRAIGHT and CURVED NEEDLES, TENACULA, LIGATURES, &c., will be treated of under another head, whilst the other instruments of dressing, as Razors, &c., are so simple as only to require the mere mention of them in order to guard against their omission in the Apparatus of Dressing.

THE PIECES OF DRESSING are Lint; Charpie; Cotton; Tow; Spread Cerate, or other ointments; Compresses; Malteese Cross; Shields for Amputations; Adhesive Strips; Setons; Poultices; Plasters; and means of Irrigation.

LINT is a soft, delicate tissue or mass, prepared in two ways, in one of which the transverse threads of

*Fig.* 1.



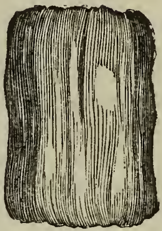
soft old linen are drawn out by a machine, leaving the longitudinal ones covered by a sort of tomentum or cotton-like mass; whilst, in the other, the cotton-like surface is produced by scraping with a sharp knife a similar piece of cloth previously fastened to some firm substance. The first is known as the PATENT LINT, and may be obtained of any druggist, being now generally manufactured. The second is the DOMESTIC LINT, and may be made at a moment's notice when the first is not convenient. They are both employed as primary dressings, either spread with ointments, or alone.

CHARPIE is a substance much employed by the French surgeons, and now gaining a more general application in the United States. It is made by collecting the threads torn from pieces of linen, four or five inches square, such as is used for patent lint. The process, however, goes a step farther than that for making lint, and tears the threads entirely apart instead of preserving the cloth. The linen from which it is made should always be new, and not worn out table-cloths, &c., as sometimes employed; Gerdy having proved, that when Charpie is made from new linen it absorbs better than when from old; Charpie is usually divided into two kinds, according to the length and fineness of the thread composing it; that which is long and coarse being employed to keep open sinuses, fistulæ, and to act as an outer dressing; while the softer, finer kind is placed in immediate contact with the part, especially where the surface requires stimulation.

Various names are given to Charpie, according to the way in which its fibres are arranged previously to its application. Thus, we have the Pledget, Roll, Tent, Mesh, Bullet, Tampon, Pellet, &c., each of which have their peculiar advantage.

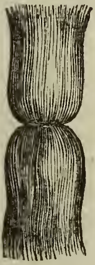
The PLEDGET is a mass of charpie formed by collecting the threads and laying them parallel to each other, with the ends folded underneath. This being flattened between the palms of the hands, may be made of an oval, spheroidal, or square shape, according to the nature of the part on which it is to be applied. As thus formed, the pledget is usually spread with cerate, and neatly adapted to the parts it is to cover; care being taken not to make it so thick as to overload and heat the surface of the wound, nor yet so thin as to permit the Pledget becoming quickly saturated with pus. Where charpie cannot be obtained, the patent lint, cotton, or tow similarly arranged, may be substituted.

*Fig.* 2.



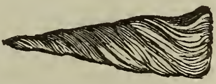
The Roll is a smaller mass of charpie, formed by rolling its fibres longitudinally between the hands, so as to make an oblong mass, which is then tied firmly in the middle, in order that when the ends are brought in contact laterally, it may form a sort of cone. It serves for absorbing pus in deep wounds where there is a tendency in the edges to close before the bottom has filled up. It is also useful in arresting hemorrhages from deep-seated vessels; pressure being made by forcing the central part upon the vessel so that the loose tissue made by the ends may assist in the formation of the clot. A director, probe, or dressing forceps is necessary, in order to carry it in to deep wounds or upon a vessel.

*Fig.* 3.



The Tent is a conical or cylindrical mass of charpie, formed like the roll, except that instead of applying a string to the middle, it is there simply doubled on itself, the loose ends being twisted by the fingers, so as to give it a spiral

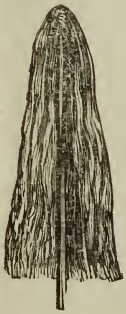
*Fig.* 4.



form and make the apex of a cone, of which the base is the part where the fibres are doubled on themselves (Fig. 4). This is also employed to dilate fistulous canals, where the orifices are too small to allow of the free escape of pus, and where only moderate dilatation is required. But where parts are rigid, the Sponge Tent, or that made by slicing gentian, carrot, or some other porous root into the shape of a cone, or plug, will be found to answer better, as it expands more powerfully.

The Sponge Tent is the one most generally employed, and certainly answers best in the majority of cases. It is prepared by soaking common sponge in melted bees-wax; allowing it to cool and harden, and then slicing it into small pieces, of such a size as will nearly fill the orifice to be dilated. The heat of the part melts the wax; the sponge fills with the fluids of the tissues, and gradually dilates them to the size required; after which a new and larger morsel must be introduced.

*Fig. 5.*

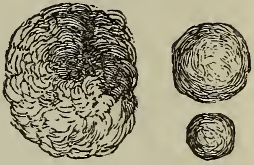


The Mesh is formed of the threads of charpie, placed parallel with each other and then bent on themselves. It is of great use in the treatment of deep fistulæ, especially fistula in ano. When thus used, it should be anointed with cerate and introduced into the cavity on the point of a probe until it nearly touches the bottom. It acts by preventing the edges from healing, thus causing the cavity to fill from below, upwards.

Bullets are little balls made by rolling charpie between the hands until it acquires this form. They are extremely porous, absorbent, and useful in filling up purulent cavities, where they prevent matter from burrowing.

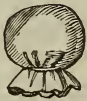
When a number of Bullets are placed together at the bottom of any cavity, either with a view of dis-tending it or of arresting hemorrhage, they take the name of Tampon. They are often thus used in gonorrhœal inflammations of the vagina; in fluor albus; and to arrest uterine hemorrhage. For the latter purpose, especially if the hemorrhage follows an operation, or a laceration of the neck of the womb, they may be made of the Boletus Igniarius, or puff-ball.

*Fig.* 6.



The Pellet is a large bullet surrounded by a piece of soft rag, the edges of which are brought together and tied firmly (Fig. 7). It is occasionally employed in the treatment of hernia, especially the umbilical hernia of children, where, when bound down by adhesive strips, or a bandage, it answers very well the purposes of a truss. It is also useful in the compression of large vessels, as in wounds of the axillary artery; in the reduction of dislocations into the axilla, and in hemorrhage from parts in the neighbourhood of the rectum, being there confined under a T bandage.

*Fig.* 7.



In the hemorrhage which sometimes follows the extraction of a tooth, a very useful pellet may be formed, by cutting a bottle cork into a cone and forcing it into the socket with a little lint, simply by closing the jaws.

For the convenience of those who may desire to obtain charpie in this country, I would state that it can now be obtained from most of the druggists in Philadelphia, of an excellent quality, at very little more than the cost of patent lint.

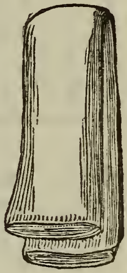
Cotton and Tow are substances which are too well known to require a description. Both are of comparatively limited utility as surgical dressings, their places being usually supplied by charpie. Before, however, the application of either of them to surgical purposes, they should be well picked or carded, to free them from foreign matter. The chief use of cotton is as a dressing to superficial burns, where it is useful by protecting them from the air, absorbing the discharges, and forming a sort of scab under which the skin readily heal. When intended to be thus used, it is, however, especially necessary to see that it is free even from *specks*, as the fly is exceedingly apt to lay its egg in it, and this being vivified by the heat of the body, generates maggots, to the great annoyance of the patient and the astonishment of all around him, who, under the belief that he is eaten of worms, usually regard it as a fatal sign.

Tow is employed chiefly as an outer dressing to stumps which are discharging freely, in order to protect the bed. Care is requisite in forming the Pledget of Tow for this purpose, that it be not too thick and heating, as union is often thus prevented. But the advantages to be derived from the use of Tow under any circumstances may, I think, be doubted, stumps having in very many instances done better with irrigation than when dressed in the old style. Since the introduction of oiled silk, caoutchouc cloth, &c., a bed can readily be protected from dampness, whilst the evidence in favour of the water dressing in the treatment of amputations is daily accumulating. With the use of collodion instead of adhesive plaster, and the water dressing instead of grease and tow, the treatment of stumps is less inflammatory than it formerly was, and results in better surfaces.

COMPRESSES are pieces of linen of various sizes, used to make pressure, confine dressings, prevent external injuries, and equalize the surface of limbs, in order better to adapt them to the application of the bandage, or the compression of the soft parts. Compresses should be made of some soft substance, as flannel, muslin, calico, &c., and with one or two exceptions applied over other dressings. When intended as a direct application to wounds they should always be made of soft linen or lint.

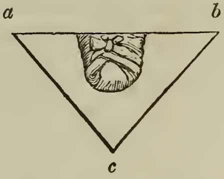
Compresses have received various names, according to the way in which the cloth is folded, or the indications to be fulfilled; thus, we have the Square, Oblong, Triangular, and Cribriform Compress, the Malteese Cross, the Half Malteese Cross, the Single and Double Split Compress, as well as the Perforated, Graduated, and Pyramidal Compresses.

*Fig.* 8.



The SQUARE COMPRESS is that in which the substance used has the same dimensions in its two principal diameters. When the square is folded so that it is twice as long as it is broad when doubled in its length, it constitutes the OBLONG COMPRESS, or Band, and is useful in surrounding the trunk or limbs. If the square piece is folded so as to unite two of it angles, it forms the TRIANGULAR COMPRESS (Fig. 9). This compress will be found exceedingly useful in confining dressings to stumps, where it is desirable to remove the dressing frequently without deranging the limb, as in the use of poultices, &c. To apply one for this purpose, cut it of such a size as will surround the limb, place the stump in the centre of the side *a b* (Fig. 9); then turn up the apex *c*, and afterwards the points *a* and *b*, confining them by pins. Then when it becomes necessary to change the poultice, loosen the ends, and turning them back the surface will be exposed to view.

*Fig.* 9.



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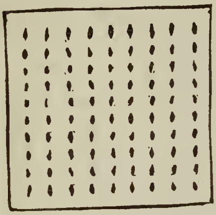
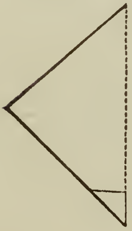
The CRIBRIFORM COMPRESS is a square piece of linen in which a number of holes are cut. It is formed by folding linen four or six times on itself, so as to make several oblong squares, one within the other; then nick the sides in several points with the scissors so as to remove small pieces, and on opening it out we shall have the form desired (Fig. 10). When spread with cerate and applied directly to a suppurating surface, the pus, passing out through the holes, will allow the compress to remain directly in contact with the surface, and thus prevent the wound from being constantly bathed in matter, which sometimes is unhealthy. The cerate with which this compress is spread is useful not only by favouring the removal of other portions of dressings, but also when thus kept directly in contact with the granulations, by promoting cicatrization.

*Fig.* 10.



The MALTEESE CROSS, so named from its shape, is made from a square piece of linen, by folding it first into an oblong square; doubling this so as to form a smaller square; joining the two angles to form a triangle, as in (Fig. 11), and folding this equilaterally, to form a smaller triangle. Then mark a line on its hypotheneuse half an inch from its apex, and slit the sides down to this line, as in that which is dotted in the figure. On opening out the linen we have a very regular cross, with a space in the centre (Fig. 12), intended to cover the front of the stump, whilst the angles go around it, and can be neatly adjusted to the convex surface of a stump without creating

*Fig.* 11.



folds. This cross is mainly used as a primary or secondary dressing in amputations.

The Half Malteese Cross (Fig. 13) is formed by slitting the two angles of the loose side of an oblong square to within an inch or two of their centre, as seen in the figure. In some cases it serves a better purpose than the full cross; as in dressing stumps at the shoulder, or hip-joint. If the linen is doubled and cut in this form it will, when opened out, form the cross (Fig. 12) as readily as the one in the plan there stated. In order to appreciate the value of these directions the student should repeat them on a piece of paper. A little practice with the scissors according to the lines just described, will soon render very easy the manufacture of these portions of dressings.

*Fig.* 12.

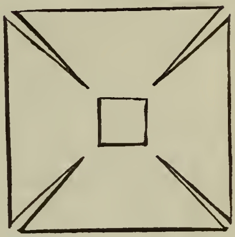


*Fig.* 13.

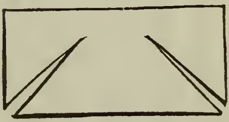
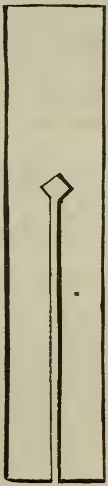


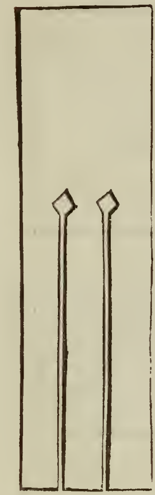
*Fig.* 14



The Retractor of Two Tails (Fig. 14) is made of an oblong piece of muslin split as represented in the figure, and intended to be used as a shield to the soft parts, in amputations where there is but one bone to be divided by the saw, as in the arm or thigh. In applying it draw the tails downwards on each side of the bone, and the upper part or body of the retractor, upwards over the stump, so as to force back the muscles and protect them from the action of the saw.

The diamond-shaped opening at the end of the split is intended to adapt it more accurately to the bone itself.

Fig. 15.



The RETRACTOR OF THREE TAILS (Fig. 15) is made like the preceding, only it is split into three tails instead of two. It is employed in the same manner, in amputations where there are two bones to be divided, as in the forearm and leg; the third or middle tail being pushed through the interosseous space, so as to protect more thoroughly the soft parts around both the bones.

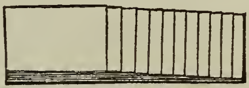
The PERFORATED COMPRESS (Fig. 16) is the name given to a piece of muslin folded several times on itself, so as to make a thick mass, in the centre of which an opening is cut. It is used in order to relieve points from pressure, especially where they have a tendency to slough, as on the internal condyle in fractures of the elbow, or on the trochanter of the femur, or on the heel, in fractures of the lower extremity. The sore point being placed in the centre of the opening is saved from the weight, whilst the pressure is borne by the circumference. Frequently it is made out of a small pad or pillow, cut and formed like a broad ring. A very excellent article of this kind is now made of India rubber cloth, so that it can be inflated. Such pads may be obtained at most manufactories, and should be made indispensable articles in hospital practice. But in any case strict attention must be paid to the parts of the limb pressed on by the circumference of the opening.

Fig. 16.

Graduated Compresses are named from their construction, and are of several kinds; the substance of each being folded differently, according to the object in view.

The Common Graduated Compress is made by folding a piece of muslin several times on itself, so that each fold may not entirely cover the one that has preceded it. It may be graduated at one end, as in the the cut, or from end to end, as would be the case if Fig. 17 had another folded end at its left extremity.

*Fig.* 17.



The Pyramidal Compress is one that is most accurately formed by placing square pieces of muslin, gradually decreasing in size on top of each other, and stitching them together so as to form a pyramid (Fig. 18). It may also be made by folding a piece of 2½ inch bandage on itself, so as to form a pyramid graduated from end to end, and then placing a piece of cotton, or other substance, in the centre of the last turns (Fig. 19). Thus formed, it is very useful in making pressure upon certain points, as in cases of hemorrhage from the deep-seated vessels of the leg or forearm.

*Fig.* 18.

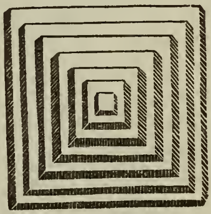
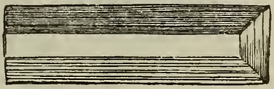
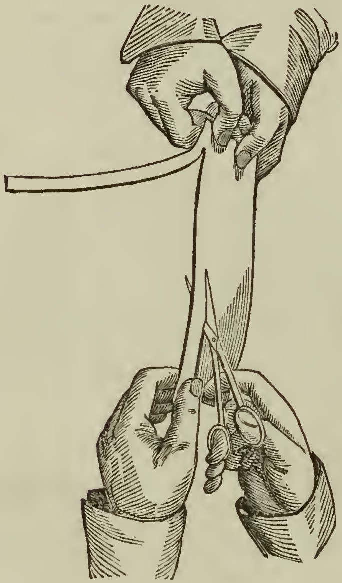


*Fig.* 19.



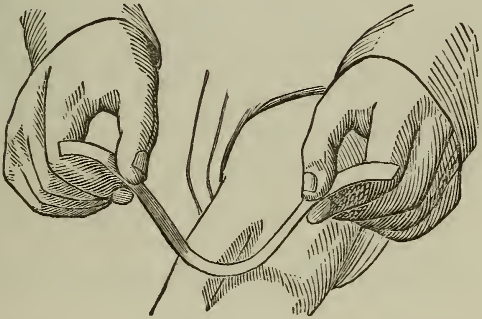
Adhesive Strips are pieces of linen spread with some adhesive plaster (usually Diachylon), and intended to promote the union of divided parts by approximating their edges or protecting the surface from the action of the air. As this plaster is kept very generally by the druggists, the formula for its composition would here be out of place. When the strips are wanted they may be prepared from the sheet on which it is usually spread by sliding the scissors according to the line of the thread of the cloth, so as to slit it into pieces about three-quarters of an inch in width (Fig. 20), and of a length sufficient to enable it to extend at least three inches beyond each side of the wound. Before applying them it is generally necessary to soften the plaster by heat, and the most convenient method of so doing is to fill a bottle with boiling water and wrap the strip around it; the *outside* of the strip being next the surface of the bottle. In its application to wounds, the strip should be first placed on that portion of the surface

*Fig.* 20.



which is most depending, in order to draw it up to the other, and not applied from above downwards. The intervals between the strips should be such as will allow of the free escape of matter. In order to remove the strips from a wound without injury, wash the part with warm water, or apply a warm poultice to it a few hours before the dressing is to be changed. After this let the dresser lay hold of one of the extremities of each piece in succession, and gently raising one end reflect it upon the wound to within an inch of the edge. Then detach the other to about the same distance, and holding the two ends together, lift the strip perpendicularly from the part, taking care at the same time to apply the thumb and index finger of the left hand on the sides of the wound, to prevent too great stress upon the new cicatrix. The manner of removal is shown in Fig. 21.

*Fig.* 21.



Adhesive strips sometimes irritate and inflame the skin, owing either to their tearing out the small hairs or down which cover it, or to the plaster being badly made, and their application is, therefore, frequently followed by erysipelas. In this case their place may be very well supplied by the slit and tail, or uniting bandage, or by the Collodion, as hereafter shown. Adhesive strips are also much used as a dressing to ulcers; for compression in cases of epididymitis or hernia humoralis, &c., &c.:

As the treatment of ulcers by means of these adhesive strips has gained much celebrity, a detailed account of Baynton's plan is here given:

"The parts," says Mr. Baynton, "should be first cleared, by means of a razor, of the hair sometimes found on them in considerable quantities, so that none of the discharges by being retained may become acrid and inflame the skin, whilst the dressings may be removed with ease at each time of their renewal. This, in some cases, where the discharges are very profuse and the ulcers irritable, may perhaps be necessary twice in twenty-four hour. After this preparation, several strips of adhesive plaster, about two inches in breadth, and of a length that will, after being passed round the limb, leave an end of about four or five inches, are to be applied to the sound part of the limb, the middle of the strap being opposite to the inferior portion of the ulcer, so that the lower edge of the plaster may be placed about an inch below the lower edge of the sore, and the ends drawn over the ulcer with as much gradual extension as the patient can well bear. Other slips are to be secured in the same way, each above and in contact with the other until the whole surface of the sore and the limb are completely covered, at least one inch below, and two or three above the diseased part.

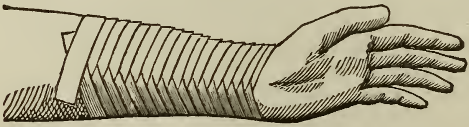
"The whole of the leg should then be equally defended with pieces of soft calico three or four times doubled, and a bandage of the same about three inches in breadth and four or five yards in length, or, rather, as much as will be sufficient to support the limb from the toes to the knee, should be applied as smoothly as possible, and with as much firmness as can be borne by the patient.

"If the parts be much inflamed, or the discharges very profuse, they should be well moistened and kept cool with cold spring water poured on them as often as the heat may indicate to be necessary, or perhaps at least once in every hour. The patient may likewise take what exercise he pleases, and it will be always found that an alleviation of his pain, and the promotion of his cure, will follow as its consequence, though under other modes of treating the disease it aggravates the pain and prevents the cure. The first application will sometimes occasion pain, which, however, soon subsides, and is felt less sensibly at every succeeding dressing. The force with which the ends are drawn over the limb must then be gradually increased until the parts are restored to their natural state, especially if the limb be in that enlarged and incompressible state which has been denominated the scorbutic.

"If the patient be of a spare habit, it may be necessary to guard against excoriation by defending the tendo-Achilles with a small shred of soft leather, previously to the application of the adhesive slips."

This plan, although published by Mr. Baynton in 1797, has had many opponents among the English surgeons, some of whom yet deny entirely its utility, or insist that it can be replaced by better and and less troublesome means, such as bandages, &c. But the experiments of Velpeau, Roux, and many others of the French surgeons, have established very conclusively the fact that it requires only about half the time to cure an ulcer under Baynton's plan that it did under the old system of ointments, &c. Velpeau, in 1840, also enlarged considerably the use of adhesive strips, on the principal of Baynton, as a means of making pressure in the treatment of other surgical diseases besides ulcers, such as chronic enlargements of the joints; in wounds in which it is difficult or improper to heal by the contact of the edges, on account of deformed cicatrises; in the treatment of burns; in ganglia, or other tumours about joints; in scrofulous ulcers of the neck, especially when presenting thickened edges or those which are undermined; and in different ulcers of the mammary region where otherwise cicatrisation would be extremely slow. "In Burns," says he, "the adhesive strips act marvellously well. In those of the first degree, one application of the strips, sustained slightly by a compressing bandage, and which may all be removed from the fourth to the eighth day, is sufficient to effect a cure. If it is a burn of the second degree, that is, one with blisters, and not attended with much phlegmonious inflammation, I remove the cuticle, cleanse the exuded matter, apply the strips and obtain a cure at the end of the second dressing, sometimes at the first, and nearly always at the third; so that if it is not cured by the fourth, it will be better to change the treatment. If there is much engorgement, with a tendency to erysipelas, I commence by an emollient poultice, or a few leeches, and then apply the strips. If the burn is of the third degree, that is to say, with change of structure, or conversion of the true skin to an eschar, the same treatment is pursued, and the cure is not less certain; only it exacts here ten or twenty days. When the burn is yet deeper and comprises the whole thickness of the derm, as the strips cannot do away with the necessary loss of substance in the separation of the eschar, it is useless to apply them before it has separated; that is, after the formation of the ulcer."

*Fig.* 22.



It must, however, be recollected that Velpeau changes the strips every three or four days, and not every twenty-four or forty-eight hours, as proposed by Baynton.

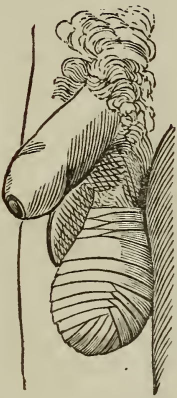
Mr. Critchett, in the English Lancet for 1848, has again called the attention of the profession to the advantages of compression in the treatment of ulcers of the lower extremity, by a plan, which though not novel, has yet much to recommend it. Starting with the proposition that ulcers in the lower extremity are difficult to heal in consequence of the pressure of the superincumbent column of blood weakening the vessels and impeding the circulation through the part, he suggests the uniform support of the entire limb by the application of adhesive strips. Having tried in a few cases of indolent ulcers his plan of treatment, I have been sufficiently satisfied with the results to join in his recommendation.

In its application the following directions will be found useful:—"Seat the patient opposite to you and support his foot on a low stool, so that the foot may rest on the point of the heal and near the edge of the stool. Then with strips of adhesive plaster about two inches wide and twelve or eighteen inches long, according to the size of the limb, apply the centre of the first strip low down to the back of the heel, and then with the flat part of both hands press the plaster along both sides of the foot," continuing the strips as high up the limb as may be necessary to give efficient support to the vessels.

In my experience, five inches above the ulcer has been sufficient; but Mr. Crichett has not stated whether or not he intends the application literally to cover the whole limb; that is, to the groin.

The advantages of this plan will be found in the ability of the patient to walk about whilst the ulcer is healing instead of being confined to bed. For a full account of the subject I must refer the reader to Rankin's Abstract, No. 9, June, 1849.

*Fig.* 23.



Nothing answers so well for a compressive bandage of the testicle in cases of Epididymitis, or chronic enlargement of the testicle, especially after free leeching, as a firm compression of the part by strips of adhesive plaster, as practised by Ricord and Fricke. In order to apply them in this case, the swelled testicle should be forced to the bottom of the scrotum by surrounding the cord with the thumb and fingers of one hand so as to form a ring, while with the other, or with the hand of an assistant, the strips are so applied as to surround the part entirely, as seen in Fig. 23. These strips should be of the width of the thumb, and applied over one another from below upwards, till the testis and a part of the cord are compressed between them. Previous to their application the parts should be cleansed and well shaved; the strips warmed enough to make them adhere, and then be renewed as often as the abatement of the swelling in the testicle may render them slack.

It may perhaps be useful to the young surgeon to say, that the use of adhesive strips to suppurating surfaces often produces a marked blackness of the skin. This is nothing but a chemical change produced in the plaster by the action of the discharges, and not the forerunner of gangrene, as many have at first supposed.

Considerable objection has been raised within the last few years to the use of adhesive strips as a means for uniting wounds, on the ground that they proved irritating, and gave rise to erythema and erysipelas. As a substitute for it, the *Isinglass plaster* has been highly recommended in England as possessing equal adhesive powers, and having the advantage, on account of its transparency, of enabling the surgeon to see the state of the wound through the plaster.

"It is composed," according to Mr. Liston, "of a solution of isinglass in spirit, and may be spread for use, as occasion requires, on slips of oiled silk; on silk glazed on one side only, and on the unglazed side. It is cut into strips of the desired breadth, and the adhesive matter dissolved immediately before it is employed, by the application of a hot, moist sponge." This plaster has been used to some extent in the United States, but with what results I am unable to say. My own experience is against it, the warmth of the part and the discharges having invariably softened the material to the same extent that the sponge did previous to its application; in consequence of which it invariably lost its hold.

COLLODION, or the LIQUID ADHESIVE PLASTER, is an article recently brought to the notice of the profession by Dr. Maynard, of Boston.

It is formed, according to a formula published by Mr. Edward Parrish in the Philadelphia Journal of Pharmacy for October, 1849, by treating cotton with nitric and sulphuric acids, and then dissolving it in ether. As the formula will probably be introduced into the U. S. Pharmacopeia, it would be out of place, at present, to do more than mention that I can testify to its excellence from having used it extensively. The non-contractile Collodion suggested by Mr. Rand in the previous number of the same journal, I have not liked so well, the contractility of the Collodion being a strong point of recommendation in the treatment of wounds. In applying the liquid to slight cuts, it is generally sufficient simply to paint the surface a few times with a camel's hair pencil. But in more extensive wounds, strips of kid or muslin may be wet with the solution, and then pressed on the part until dry, this usually happening in a few minutes after the application, from the rapid evaporation of the ether.

The advantages of Collodion over adhesive strips will be found in its more permanent adhesion, neither heat nor moisture nor anything but ether being able to soften it. It also enables the surgeon to approximate parts without irritating the edges of a wound by contact with the plaster; whilst its tenacity is so great, that an adhesion of the end of a strip for one inch will be capable of sustaining a weight of several pounds.

Collodion has, also, proved an excellent dressing in sore nipples, excoriated surfaces, burns, ulcers, small nœvi, &c., &c., of which numerous cases have been recently published.

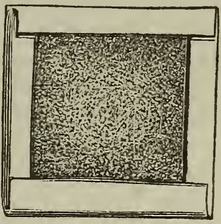
In the after-treatment of hare-lip, wounds of the scalp, dissecting punctures, &c., I have found it act admirably; and when applied to oil silk, in a manner similar to that directed for court plaster, the silk being moistened with a little ether immediately before its application to the skin, it has proved a firm and neat dressing. From the numerous purposes to which Collodion has been recently applied, the article is evidently, as yet, only in its infancy. (See Blisters.)

Court Plaster, sometimes called gummed silk, is occasionally used in slight wounds and excoriations, although mainly in domestic practice. The English court plaster, which is generally deemed the best, is made by placing one part of choice isinglass, cut into little pieces, in an earthenware vessel upon a sand bath, and digesting it in four parts of water. When this is dissolved, it is strained through a fine linen cloth; eight parts of alcohol are added, and it is evaporated to one-half, again strained, and the tepid liquid then spread upon black silk with a camel's hair pencil. Four or five layers are thus put on, care being taken to see that the former is perfectly dry. Between the last two coats of the Icthyocolla, a little Tinct. of Benzoin or Bals. Peru is added to give it an agreeable flavour. Thus prepared, the plaster is allowed to dry for twenty-four hours. When used, a piece is to be moistened by placing the gummed side on the tongue and immediately applied."[1]

POULTICES or CATAPLASMS are different kinds of pulp or pastes, intended to cover injured surfaces, the character of the substances being varied according to the object to be gained from their application.

The EMOLLIENT POULTICE may be made of any mild, unirritating substance, as bread and milk; bread and water; bran and water; corn-meal and water; and ground flaxseed, or flaxseed meal. The latter forms decidedly the best poultice, not only as regards its properties, but also its economy. It is prepared by pouring hot water on the meal, and stirring till the paste acquires such a consistence as will prevent its running from softness, or drying and breaking off from being too stiff. In order to spread the poultice, a portion of the paste should be dropped on a suitable piece of muslin, and levelled of an even thickness, say about one-fourth or half an inch; the free ends of the muslin being then folded over so as to form a sort of frame or border, and prevent the adhesion of the edges, or their hardening (Fig. 24). If the meal is not fresh it will be necessary to rub a little sweet oil or lard over the surface of the poultice, or to cover it with a piece of fine gauze previously soft-

*Fig.* 24.



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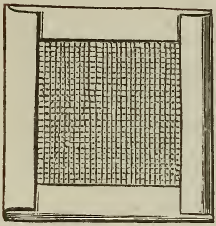
[1] BOURGERY.

An analogous preparation will be found in the U. S. Dispensatory.

ened in warm water, which will prevent its adhesion to surrounding parts (Fig. 25).

*Fig.* 25.



Every poultice should be renewed at least twice in twenty-four hours, or more frequently if it becomes hard and dry. Care must also be taken that the meal has not fermented, or the oil, if used, become rancid, as the application will then irritate instead of soothing the part. The bread and milk, or bread and water poultice, is made by breaking the crumb of bread into either of these liquids till they have the proper consistence, when they may be spread and used like that first mentioned. This and every other poultice will be more useful if covered on the outside by a piece of oil silk, as this will prevent its becoming hard and stiff.

The ASTRINGENT POULTICE is formed of the above by adding any astringent article. Frequently it consists of bread and lead-water, or of a curd made by throwing alum into boiling milk and straining off the whey, or rubbing alum up with the white of egg. The oak bark, pomegranate, persimmon, nutgall, bistort, tormentilla, &c., are also sometimes employed, beaten into a pulp, or mixed with other and more adhesive or farinaceous substances. They may be used in any proportions.

The STIMULATING POULTICE is formed of various substances, as boiled carrot grated down to a pulp; raw potato grated and applied cold; grated onions; grated horse-raddish; cloves of garlic; black pepper; or corn-meal and some fermenting liquor, as yeast or porter. An excellent stimulating poultice, especially adapted to scrofulous or indolent ulcers, may be made by thickening strong brine with corn-meal; but to prevent its drying too rapidly this poultice must be spread on, or covered with the oiled silk as before stated.

The Fermenting Poultice, or that made of corn-meal and porter, it must be especially remembered should, also, always be spread on or covered with oiled silk; and should, likewise, be covered by the gauze to prevent its adhesion. In cases of sloughing, mortification, hospital gangrene, &c., it will be found of great service. A fermenting poultice to be well made requires at least twelve hours to prepare, in order that the process of fermentation may have thoroughly extended itself throughout the mass.

The Mustard Poultice is prepared by mixing flowers of mustard with water, to the consistence of that which is commonly employed for the table, and then spreading it very thinly on muslin, allowing it to remain on the part only till it reddens it, be it five or fifty minutes. The vinegar with which the mustard is sometimes mixed, so far from increasing its powers of stimulation, materially weakens them.

Narcotic Poultices, or those containing opiates, as poppyheads, or powdered opium, &c., will sometimes prove very serviceable, and may be made by the addition of any of these substances to an Emollient Poultice.

To confine a poultice to a part, some of the bandages or handkerchiefs hereafter mentioned may be employed, at the option of the surgeon.

Plasters are made of various substances, and are occasionally employed to soften indolent tumours, procure their resolution, or hasten their suppuration. In their preparation the surgeon has no part, as this properly belongs to the apothecary. He may, however, be required to direct the shape of them, in order to ensure their more accurate application. In general, nothing more is

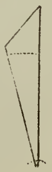
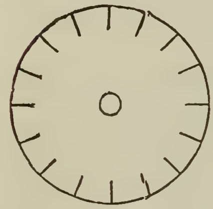


*Fig.* 26.

necessary to adapt a plaster to a part than to slit the angles which project when the plaster is applied to the surface. But in the plaster for the female mammæ a peculiar shape is required, which may be best obtained thus:—Fold a piece of paper on itself, so as to form a perfect square of the size required; fold this so as to make an oblong square; double it and fold its angles so as to make a smaller square; fold this into a triangle, and round off its upper angles as in the dotted line (Fig. 26). Then cut off semicircularly as much of the point as will make an opening large enough to admit the nipple, or more if desired, and slit the sides at the circumference for one inch towards the centre. This when opened out will give the figure required (as in Fig. 27), and will enable any one to spread a plaster of a proper shape.

*Fig.* 27.



Irrigation, or the water-dressing, is the term applied to certain dressings which are intended to keep parts constantly moist, and thus diminish an excess of inflammatory action. In simple erysipelas of some extent; in phlegmonous erysipelas; in compound fractures; in sprains; dislocations, and other injuries to joints; and in cases of sloughing from excessive action, as after amputations, they afford a most excellent means of combatting inflammation. In order, however, that irrigation may be most advantageous, considerable care and attention is requisite on the part of the nurse in its application, as well as judgment on the part of the practitioner, in selecting warm or cold water. Whichever is used, it is a matter of some importance to keep up a constant supply of the liquid, for if the stream is not kept up steadily there will be a constant change in the temperature of the part, and a reaction from cold to hot, or the reverse, which will do harm by exciting an increased circulation in the part. There may, also, be too great a degree of cold, or the patient become wet with the dressing, or suffer from cold in some internal organ, &c. As illustrative of the marked advantages of irrigation by cold water in the treatment of numerous injuries, I would here cite the following cases reported by Mr. Gilchrist, of Aberdeen, in the British and Foreign Medical Review, for July, 1846.

"1st. A man received an injury by the machinery in a large paper-mill, which laid open the wrist-joint. The hand was half separated from the forearm; the tendons were torn, and the inferior end of the radius, which is naturally related to the carpus, was exposed; the arm and hand were placed straight upon a pillow, the wound was cleaned, and two stitches taken; a pledget of cloth soaked in cold water was applied, and a bandage rolled, not too tightly, round the hand, wrist, and forearm; a large basin of cold water was placed conveniently by the bed-side, and directions left to apply freshly-soaked cloths over the bandage every two or three minutes, to prevent any heat or inflammation ensuing. No inflammation took place; the modelling process was uninterrupted, by suppuration, and an excellent cicatrix formed in little more than a fortnight.

"2d. A girl had the whole of the soft parts on the palmar surface of the four fingers as it were scraped off by the machinery in a flax mill; the tendons were torn, and the phalanges exposed at different places. Each finger was dressed as follows every day: being first bathed in cold water, a piece of soft cloth was placed round the finger, and a narrow roller to keep it applied; when the fingers were all thus dressed, a larger cloth soaked in cold water was wrapped round them together, and changed as frequently as it showed the slightest tendency to become heated.

The modelling process advanced steadily without suppuration, and cicatrisation was completed in about four weeks. The fingers gradually acquired flexibility.

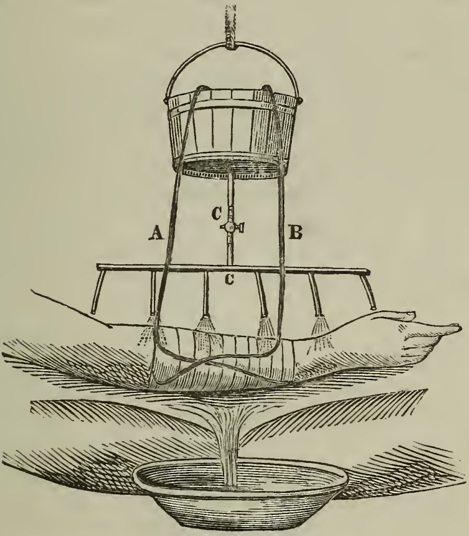
"3d. A little boy had scrofulous disease of the bones of the ankle-joint, on account of which I amputated, by the flap operation, below the knee. Two stitches were used for two days; a strip or two of plaster, and cloths wrung out of cold water, were the sole applications. The wound was whole in a week. Other amputations have been similarly treated, with equal success.

"4th. A girl received a sharp instrument in the ball of the eye at the Woodside works. The cornea and sclerotic coat were ruptured; the iris was lacerated, and prolapsus followed. Rest in bed; continued persevering use of cloths wrung out of cold water, and simple laxative medicine constituted the treatment. The treatment was effectual in preventing inflammation, which was clearly the only indication in the case. The termination was as favourable as it could be, under the circumstances."

These cases are strong arguments in favour of this simple and ancient remedy, and might be supported by numerous others, of a similar kind, that have fallen under my own observation, did it seem necessary. I will only, however, now mention a few instances where much benefit may be gained from the use of cold water, and in which the popular tendency to Hydropathy, at present existing, may be most usefully directed by the surgeon in the scientific treatment of many of the injuries daily coming under his notice. Thus, a stream of cold water from a pitcher or syphon will be found highly serviceable in acute as well as chronic sprains; in false anchylosis; stiffness of muscles after fractures; chronic indurations and glandular enlargements, &c., &c.; whilst the recoveries after amputations, when the cold-water dressing has been used, have been such as have proved highly satisfactory.

The simplest form in which Irrigation either with hot or cold water can be properly arranged, is that shown in the cut. (Fig. 28, A B and C.)

*Fig.* 28.



The limb to which it is to be applied is first laid upon a piece of oil cloth or coach-curtain, to prevent the wetting of the bed and clothes of the patient. This is to be bent on the outer side, so as to form a little gutter to carry off the water, after it has gone on the limb, into the vessel placed below. Then a pan filled either with cold water, cold lead-water, or other cold or hot lotion, should be placed near the bed at such a height as will be most convenient, and from it strips of patent lint twisted together; or, what is better, a piece of cotton-wick, as A and B, made to extend to another piece of lint covering the part affected. The wick, previous to its application, being wet absorbs readily the fluid in the basin, or, in other words, forms a Syphon.

Another mode of irrigation, which is rather neater, is by means of a tube with a cock, arranged as in the same cut at C. This may be made at a moment's notice by any tin-plater, or extemporaneously, of a piece of cane-angle and some quills.

In either case, if the patient complains of the cold or heat, it is easy, by means of the cock, or by plugs of wood introduced into the quills, to regulate the amount of fluid which shall pass over. But this is the only advantage which the latter apparatus possesses over the syphon, while the simplicity of the latter, and the facility with which it may be made and applied, recommend it strongly to favour.

## RULES FOR DRESSING.

It will now be seen, that as the different articles employed in Dressing are very varied, and the cases to which they are applicable equally so, it must be a difficult matter to give special directions as to their employment. Nevertheless, there are certain rules founded on common usage, and such as experience has tested, that will be found advantageous to the young dresser, by enabling him to anticipate difficulties for which he would otherwise be unprepared. Thus, the choice of the position of both surgeon and patient; the selection of assistants; the order in which the different articles are to be employed, &c., may readily be reduced to general laws; whilst the modifications required for particular cases can be treated under special heads.

Before proceeding to any dressing or operation, it is important that every step of it should be anticipated in order that nothing may be wanting. Proper assistants should also be ready, and each of them made fully to understand the duties that he will have to perform. Especially is this necessary in the treatment of cases in private practice, where the surgeon is often obliged to take his assistants from among the friends of the patient. These, from a desire to aid, are generally very ready and willing to perform whatever may be asked of them; yet when actually engaged, become faint, sick, hurried, or otherwise unfitted for duty, in consequence of some peculiarity of system, or from want of habit. Even medical men will thus occasionally be thrown out of service, as very many are sickened by a bloody operation, or disgusted by a simple dressing, accompanied only by the smell of unhealthy pus, &c. As every surgeon has frequently experienced this even in very simple cases, all will readily admit that the selection of assistants is a matter of the first importance.

The observance of the following rules in regard to dressing will be found to add very materially to the comfort both of the patient and surgeon.

1st. Let the surgeon make, or see made, everything that is requisite for the new dressing before removing the old one.

2d. Let him have a sufficient number of capable aids, to whom special duties shall be assigned before commencing the dressing, as this prevents confusion. Thus, in dressing a stump, or wound, there should be one assistant to support the limb; another to furnish hot water, and change it as required; heat the adhesive strips, hand cerate, &c., &c., by which means the surgeon can give his attention wholly to his own duty.

3d. Let him arrange the bed, as a general rule, *after* the dressings are changed; or, if in a case of fracture, *before* the patient is placed on it.

4th. Let the position of the patient be such as will cause him no unnecessary fatigue.

5th. Let the surgeon, as a general rule, place himself on the outside of the limb with his face to the patient, as this will give more freedom to his movements, and prevent accidental jars.

6th. Let all the assistants be especially careful to guard against hasty and inconsiderate movements, in order to prevent unnecessary pain to the patient.

The other duties of assistants in dressing or operating will be treated under the head of Minor Operations, Part Fifth.

# CHAPTER II.

## OF THE PREPARATION AND APPLICATION OF THE BANDAGE.

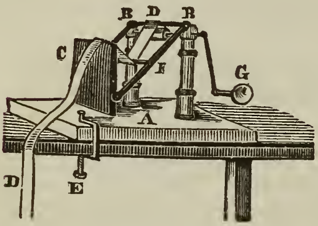
By Bandaging is generally understood the confinement in their proper situation, of dressings or other surgical apparatus, by means of pieces of muslin.

The term Bandage, in its strict signification, is only applicable to a collection of bands, or to such pieces of stuff as are fastened to one another and employed as a whole; though general usage now justifies its application to the single strip or Roller. This roller is generally a band of flannel, linen, muslin, calico, cloth, gum-elastic, or other substance, of different lengths and widths, rolled upon itself into a firm mass, so as to render its application to any part of the body more easy than it would be if simply folded up. As most generally seen, the roller is formed of muslin, eight or ten yards long; one-half, two, two and a half, three, or four inches wide, free from hems or darns, soft, pliable, and unglazed, to prevent its slipping. As thus made, bandages may be divided into two kinds:—1st. Simple, or those formed by the application of the roller only; and 2d. Compound, or those resulting from the complex arrangement of the pieces composing them, as in the double T, sling, &c.

### OF THE SIMPLE BANDAGE, OR ROLLER.

The Roller is to be prepared from a piece of muslin of the requisite length and width, by tearing it from the piece and then winding it into a cylindrical form, either by a machine, or by the hand, so as to form one or two masses, and constitute what is called a Single or Double-headed Roller. A machine for rolling bandages, one of Dr. Barton's earliest contributions to Surgery, is seen in Figure 29, and may well serve as a pattern for others, as its adaptation to the purpose has been long tested and found satisfactory. It consists of a base A, and of two uprights, B B, in which runs a spindle, G, to receive the bandage; a broader upright, C, to support a moveable frame, F, which, by its pressure, tends to tighten the bandage, D D, as it is rolled, and of a screw, E, to fasten the machine to a table. Various other machines, modified to suit peculiar views, are used by other surgeons, and thought to possess peculiar advantages; but the principle of all is the same. When, in hospital practice, it is desirable to economise material, and re-apply a bandage several times, the use of a machine like that which I introduced into the Pennsylvania Hospital in 1837, will be found advantageous. It consists in a machine like Fig. 29, with the addition of two hollow steel cylinders between which the bandage is passed as it winds on the spindle. These cylinders, receiving a hot iron in their centre, smooth the bandage as it passes between them.

*Fig.* 29.



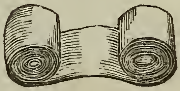
In rolling a bandage on any of these machines one extremity of the band should be wrapped around the spindle, and wound up by turning the handle with one hand and directing the course of the band with the other, so as to ensure its being wound evenly. Then seizing the roller firmly, reverse the action of the spindle; draw it out of the cylinder and tear off all the loose threads, as they will not then unravel much if the cylinder is tightly rolled, but will, if left, retard its application. If the threads are torn from the strip before it is formed into the cylinder, a large portion of the stuff will be wasted in ravellings.

*Fig.* 30.

Thus formed, the SINGLE-HEADED ROLLER consists of two extremities; of an initial or free end; of a terminal one, or that found in the centre of the cylinder; of two surfaces, an external and an internal, and of a body, or portion between the two extremities.

The DOUBLE-HEADED ROLLER has the same parts as the single one, except the initial end, which is wanting, in consequence of both ends being here wrapped into cylinders. The application of this roller, therefore, always commences with its body.

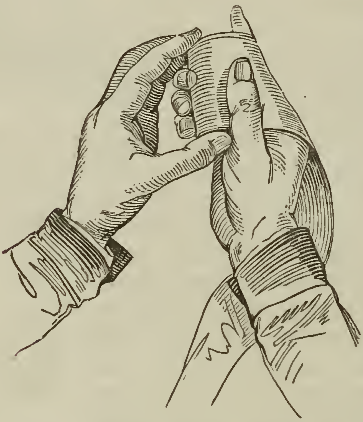
*Fig.* 31.



With a machine at hand, there can be no reason why every surgeon should not keep himself well supplied with bandages. But as a necessity sometimes occurs for the re-application of the same roller, both from economy and convenience, or from a surgeon being accidentally unprovided with a roller, he should early accustom himself to the manufacture of a bandage without using the machine. In order to do this with the greatest ease the following directions will be found serviceable:—Fold the terminal end of the band five or six times on itself, so as to form a sort of axis, and roll it a few times on the thigh to give it size. Then place the cylinder between the thumb and forefinger of the left hand; allow the body to run over the right forefinger, seizing it firmly between the thumb and finger of that hand so as to make traction, and tighten the cylinder. Having thus arranged it, give a rotatory motion to the band, and cause the cylinder to revolve upon its axis by means of the fingers and thumb of the left hand, whilst, at the same time, the right thumb and forefinger revolve partially around the cylinder itself, which, by this compound movement, is soon formed as required.

Fig. 32 shows the position very well, and will explain the directions just given, simply by looking at it.

*Fig.* 32.



After a very little practice a student will find it an easy matter thus to roll a bandage with either hand almost as quickly and tightly as it can be done on the machine, although at first the movements will seem to be very awkward.

When a roller is intended for the body it should be twelve yards long and about four inches wide; when for the head, five yards long by two inches wide; when for the extremities, eight yards in length, and two, two and a-half, or three inches in width, according to the size of the limb, the thigh requiring a roller to be a little wider than that used for the leg.

In order to apply the single-headed roller to any part of the body it should be held between the thumb and fingers of either hand, and pressed by the fingers firmly against the palm, so as to prevent the cylinder from slipping out of the hand as it unrols, which it is apt to do if held so that its internal surface would be the part first applied. Or, it may be held by placing the thumb and first and second fingers of either hand on the two extremities of the cylinder. In either case, the *external surface of the free end* must be the portion first applied to the part, and this should be retained there by pressure of the fingers until one or two turns are made round the part so as to fix it firmly; after which the roller may be carried up the limb.

Bandages have been divided into several kinds, either according to the direction which they take in covering the part; or from the object to be attained by their application. Thus, we have the Circular, Oblique, Spiral, Figure of 8, Spica, and Recurrent, of the first kind, and the Uniting, Dividing, Compressing, Expulsive, Retaining, &c., of the second.

A CIRCULAR BANDAGE is one formed by horizontal turns of a roller, each of which overlaps, or very nearly overlaps, the one which preceded it.

In the OBLIQUE, the turns gradually ascend the limb, or pass obliquely to its axis.

In the SPIRAL they mount still more; the SPICA forms a figure like the leaves of corn, and in the RECURRENT, the folds run back to the point whence they started.

The UNITING BANDAGE is named from its action, and is that which is used to bring together the edges of wounds. It should be adapted to their direction according as they take a longitudinal or transverse course, and will be again referred to under the treatment of wounds.

The DIVIDING BANDAGE is one which is used to prevent the formation of cicatrices, as in the treatment of burns, or of wounds, attended with great loss of substance.

The COMPRESSING BANDAGE is the name given to any bandage which is employed for exerting compression, as in œdematous swellings, callous ulcers, varices, aneurisms, &c.

The EXPELLING BANDAGE is employed in the treatment of deep-seated abscesses, fistulæ, contused wounds, &c. It is usually a roller applied over compresses, upon the region wherein the matter to be expelled is placed, and acts by preventing these fluids from travelling along the interstices of the muscles, &c.

RETAINING BANDAGES are those which serve to confine dressings and displaced parts in their proper situation, examples of which are seen in those used in the treatment of fractures and dislocations.

The necessity which so often presents itself of applying to the different parts of the body some of the bandages just referred to, has rendered the study of bandaging one of the important points of a student's education; yet, from its having been too generally overlooked, it not unfrequently happens that a practitioner finds himself in charge of a case, requiring considerable skill in dressing, before he has gained as much dexterity as would be possessed by any good surgical nurse. If, then, it is deemed desirable to avoid mortification, or if he wishes to perform a duty in the manner that its importance deserves, every student will at once take a roller in hand and exercise himself until he has acquired such manual skill as practice alone can furnish.

Any bandage which does not give perfect support to the parts, maintain them in the position necessary to ensure the fulfilment of the indication proposed, or exert on the member an equable compression, is useless, or worse than useless, as it may produce such a state of things as will eventuate in the loss of the limb, or even of life; and this loss should rightly be charged to the defects of the medical attendant. Their proper application is, therefore, a matter of great importance.

In no department of surgery, says Dr. Hennen, " will the reputation of a young practitioner be more seriously involved than in that referring to the application of the bandage. Our young surgeons may study, philosophise, and reason well, but neither books nor reflection, nor arguments, will teach the application of a bandage without repeated practice." Practice alone can give the dexterity which is so necessary for its proper employment; and unless a bandage is proper applied, it had better be omitted; for if too loose it will not fulfil its indication; and if too tight may produce gangrene."

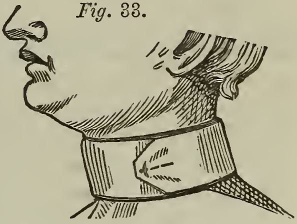
The practitioner's reputation is also liable to considerable injury, as he will be sure to suffer from the judgment of those around him, if he shows ignorance of this important duty. The majority of persons, says Hennen, "are ever attentive to the manipulations of any workman, and can soon judge, and judge correctly, whether or not he is acquainted with his business; consequently they do not hesitate to exercise their criticism to its fullest extent, in the case of the surgeon; and when their opinion of his ignorance is confirmed by the patient's continued suffering, they are ever ready to disseminate it widely." On the contrary, when a bandage lays smooth and regularly on the limb, when the patient is relieved from previous torture, and the part assumes the neat appearance that always follows the visit of an experienced dresser, the confidence of friends is raised, and his subsequent visit is looked forward to with confident anticipations of relief.

Surgeons who, from want of practice, cannot produce the neat appearance of a well-applied bandage, are frequently induced, in order to escape the remarks so often made on this point by those around the patient, to resort to the wetting of the roller, in order to cause it to adapt itself more readily to the part. But this practice should never be permitted except in the treatment of Dislocations, unless we would wish to expose a patient to the risks of mortifications, as it is impossible for any one to calculate how much a wet roller will shrink in drying, and consequently how great a degree of pressure it will make on a part after we have left it. A bandage may be of the proper degree of tightness at the time, the patient make no complaints, and yet in three or four hours be suffering such agonies as must be seen or felt, to be properly appreciated. The question, then, may very properly be asked, as to how much traction should be made in order properly to apply a roller. To a certain extent this must depend on the object to be attained in its application, as a bandage which is merely intended to confine a dressing need not be as tight as one that is used to compress muscles. But, as a general rule, a bandage is not too tight if the patient feels easy under it two or three hours after its application. Until then practice has taught the practitioner the degree to which a roller should be drawn, the fact must be recollected, that one which is too tight will do serious injury, while all that can result from one that is too loose will be the non-fulfilment of the indications for its application. The young surgeon had, therefore, better guard against the first evil, as repeated evidence has shown that the tendency of all young dressers is to use too much traction on a bandage, and not too little. In order to learn the proper degree of tightness, it is only necessary to practice on a friend, or, what is better, allow that friend to practice on us, when the suffering that will be inflicted by his want of skill will doubtless prevent the lesson being soon forgotten.

In the consideration of the special application of the roller, I shall take up—1st, its application, according to the course which it takes around the part; and 2d, that resulting from the object to be attained in its application, commencing with the head and proceeding regularly to the toes.

The Circular Bandage is that, as has been said, in which each turn overlaps the one that preceded it, so that the whole bandage looks like a single turn, and runs directly round the part. (Fig. 33.) All the circular bandages are very simple, and consist of, one for the Forehead, in which the turns encompass the vault of the cranium; one for the Eyes, to retain dressings to these organs; one for the Neck, as in the dressing of blisters, setons, &c.; one for the Arm, as in the compression of the veins previous to bleeding; and a few of a like nature for other parts of the body.

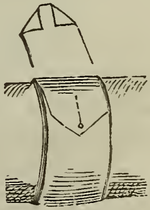
*Fig.* 33.



In the confinement of the terminal end of a circular, or any other bandage, two means are employed: 1st, the use of pins; 2d, the employment of little bands tied in bow-knots.

When pins are used, they should be placed either in the direction of the length or breadth of the band. If in its length, the head should always be turned from the free end of the roller (Fig. 34), otherwise the tendency of the roller to become loose, and the constant drawing against the pin, will at last withdraw it entirely. On the other hand, if the pin is applied transversely, the head should always present to the upper extremity of the limb, in order to

*Fig.* 34.



prevent the point from sticking in the fingers of the surgeon when his hand is passed down the part, either in smoothing the turns of the roller or in seeking for the end of the bandage in its removal. (Fig. 36.) A reference to Fig. 35 will show how the pin may be drawn out by the unwinding of the roller itself. Some surgeons prefer fastening the end of a roller by means of a piece of tape, or by slitting it for a short distance into two strips and tying the pieces in a bow-knot (Fig. 37); but this fastening is seldom as neat or firm as the pin, except when bandaging fingers or toes. In these portions of the body it will be found to be rather more convenient.

*Fig.* 35.

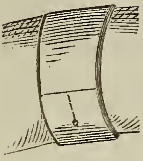
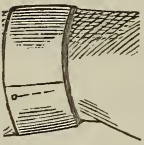
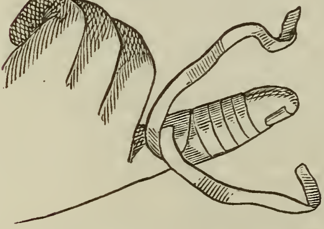


*Fig.* 36.



The Oblique Bandage differs from the circular, in its turns being made less at right angles to the axis of the limb, in consequence of which the roller can be made to cover a greater extent of surface, as each turn passes a little beyond the one previously made, and follows a course which leaves a considerable space between the turns. The oblique bandage is chiefly employed in retaining dressings, although occasionally useful, especially when conjoined with other bandages, in cases which will be treated of hereafter.

*Fig.* 37.



The Spiral Bandage is that which is most frequently employed in the treatment of all affections, whether of the extremities or trunk. Its turns ascend the limb less rapidly, are closer together, and cover the part much more firmly than the oblique, thus making a certain amount of pressure in addition to the retention of the dressing. Each turn of the spiral bandage should cover in at least one-third of the preceding turn; and as most of the parts to which it is applied are conical in their shape, especially in the extremities, it follows that in ascending from the lower to the upper portion of them we must pass from the apex of the cone to its base, and that, consequently, one edge of the roller will press on the limb, while the other will project from it so as to make the openings designated as Gaps, as seen at *a*, *b*, *c* (Fig. 39). To obviate this, and cause the bandage to apply itself more perpendicularly to the whole surface of the part, or, in other words, to equalize the pressure, the roller must be half folded on

*Fig.* 38.

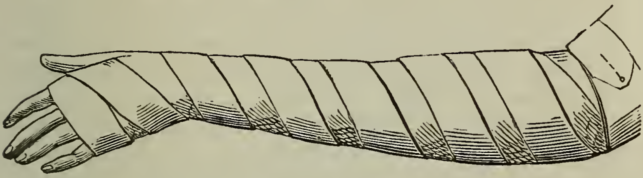
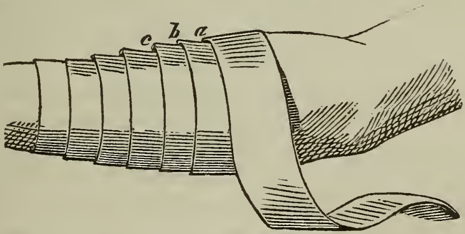


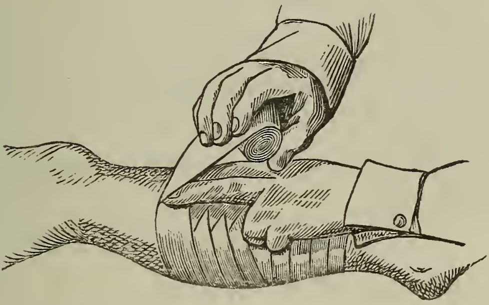
*Fig.* 39.



itself, or a doubling made, which is called a Reverse; and as the bandage by this action acquires an increased thickness, a greater degree of pressure will be made on the reversed points than at any other. It is therefore desirable, in order to obviate the welts, and other bad effects occasionally resulting from these reverses, that the turn should be made as short and smooth as possible. To make a reverse is, therefore, a matter of much importance, and constitutes the first difficult step in bandaging; not that there is any real difficulty in the manœuvre, but simply, I think, because sufficient attention is not generally paid to its mechanism. The following rules, which constant practice and extended experience have established, will render the matter perfectly simple; and if observed, not only make the formation of a reverse very easy, but also make it almost impossible to prevent its proper formation:

*Rules for making Reversed turns.*—1st. Hold the roller in the position in which it is generally applied, that is, either by its body or its two extremities, the hand being in a state of supination. 2d. Apply the initial extremity to the limb, and continue to make simple spiral turns until you approach the enlarged portion of the limb. 3d. Apply a finger of the free hand to that portion of the bandage which is already in contact with the limb, not to assist in forming the reverse, or to fold it down, but simply to prevent the turns already applied from slipping or becoming relaxed while the reverse is being made. 4th. See that no more of the bandage is unrolled than will enable you to separate the cylinder a short distance, say four or six inches from the limb. 5th. Keep that portion of the bandage which is between the finger, fixing the body of the roller and the cylinder perfectly slack. 6th. Turn the hand holding the cylinder from supination into decided pronation, by a simple motion of the wrist alone, without moving the fingers from the cylinder, as shown in (Fig. 40), taking especial care *to make no traction*, nor to sink the cylinder below

*Fig.* 40.



the level of the limb till the fold or reverse is made, when it may again proceed up the limb, it being recollected that each turn should ascend spirally, and only cover in about one-third of that which preceded it. 7th. Keep each turn and each reverse parallel with its fellow.

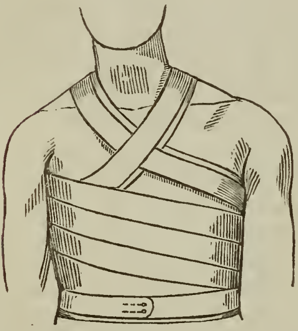
As these reverses are indispensable wherever there is an increase in the size of the part, as from the development of muscles, &c., it is of the greatest importance that the proper way of making them should be acquired, as no spiral bandage can well proceed six inches on an extremity without requiring their formation; and although they are generally regarded as the most difficult point in the application of the roller, a little attention to the rules just given, especially to that which requires that no traction should be made, nor the cylinder sunk below the limb, or widely separated from it whilst the reverse is being formed, will enable any one after a little practice to make them with great ease and neatness. To add to the latter, all the reverses should, as far as possible, be kept in a perpendicular line, as seen in the cut of the spiral of the lower extremity, and this will always result without extra attention, from the observance of the direction to keep the edges of each turn parallel. I repeat that the difficulties experienced in making reverses, and the terrible, twisted, and corded things, sometimes made for reverses even by those who are good operating surgeons, are always the result of traction on the bandage, while the reverse is making.

The special applications of Spiral Bandages are as follows: first,

### THE SPIRAL OF THE CHEST.

The application of this requires a single headed roller ten ort welve yards long and three or four inches wide, and that the patient should be sitting in such a position as will enable the surgeon to pass the roller readily behind his back. In applying the bandage, place the initial extremity on the anterior part of one axilla, say the left, and conduct the roller upwards across the front of the chest. Pass over the right clavicle and the back, to the point of departure, similar turns being thus made until there is formed one or two obliques of the neck and that axilla whence it started. Then carry the roller across the front of the chest to the right axilla, and form an oblique of this axilla and the left clavicle; after which, carry it firmly around the chest in spiral turns from above downwards, drawing each

*Fig.* 41.



turn with firmness, so as to compress the ribs, and oblige the patient to breathe by the diaphragm and abdominal muscles.

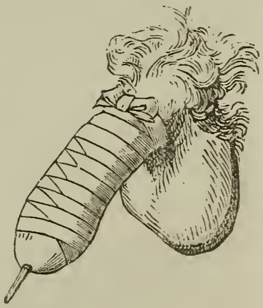
*Use.*—In fractures of the ribs or of the sternum, care being taken to apply compresses to their anterior and posterior extremities, if the fragments project inwards; but if the deformity is angularly outwards, place a compress only upon the projecting point. It is sometimes useful if the patient, from mania à potu or other causes, should be very restless, to add to this bandage the T bandage for the body, shown hereafter, in order to prevent the roller from slipping; but, generally, the oblique turns of the neck and axilla will answer this purpose.

### THE SPIRAL OF THE ABDOMEN

Is formed of the same kind of bandage as the above; but in its application we should commence at the lower part of the chest and carry the roller spirally round the abdomen from above downwards, adding to it a single T, or making one or two oblique turns around the thighs to prevent its slipping upwards.

*Use.*—To compress the abdomen, as in certain cases of tympanitis, or after the operation for tapping in ascites. But its place may be well supplied by a double T of the abdomen, when firm pressure is not required.

*Fig.* 42.



### THE SPIRAL OF THE PENIS

Requires a bandage eighteen or twenty-four inches in length, half an inch wide, and slit into two pieces at its terminal extremity. Then commencing at the glans penis, form an ordinary spiral which shall terminate at the root of the penis, and be confined there by tying the two ends. (Fig. 42.)

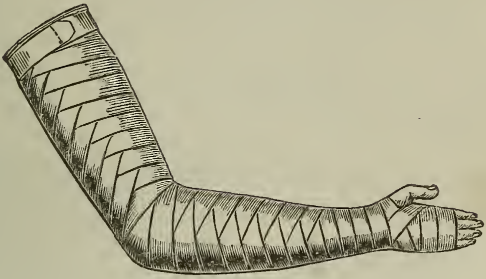
*Use.*—This is chiefly employed to retain dressings to the penis in cases of chancres and other sores external to the prepuce. It has also been used in the treatment of gonorrhœa, in order to compress the urethra, a catheter being left in it; but it is very apt to produce erections, which do harm, and quickly derange the bandage. The sheath of the penis, spoken of hereafter, answers better in many instances, and especially in gonorrhœa.

### THE SPIRAL OF THE UPPER EXTREMITY

Requires a roller eight yards long, two or two and a-half inches wide, and compresses, if it is to be used to make pressure on particular parts, and act as a Compressing Bandage. In its application, having covered in the fingers, if necessary, by the gauntlet, as shown hereafter, commence with one or two circular turns around the wrist, in order to fix the end of the bandage; then pass obliquely over the back and palm of the hand to reach the extremities of the fingers, and ascend by three spiral turns without reversing, until the phalangeo-metacarpal joint of the thumb is reached; cover this and the wrist-joint by a figure of 8, such as is described hereafter, and ascend the limb by simple spiral and reversed turns till we reach the elbow. Cover this also by a figure of 8, if the arm is to be flexed; if not, by simple spiral turns without reverses, and continue the spiral and reverse turns to the shoulder, placing compresses, &c., where they may be required (Fig. 43).

This bandage is daily used to cover in, support, and compress the arm, as in varicose veins, aneurismal tumours, treatment of fractures, &c., and is with the exception of the turns for the elbow perfectly

*Fig.* 43.



easy. Attention to the figure of 8 bandages will soon overcome the latter difficulty.

Its effects, when well applied, are excellent; but it may become very fatiguing and painful if drawn tight, and if too tight may produce gangrenous ulcer, &c. In 1837, it was found necessary in the Pennsylvania Hospital to amputate the forearm of a man who had only a simple fracture of the lower extremity of the radius, but whose arm was gangrenous from the mal-application of this bandage by an ignorant surgeon.

### THE SPIRAL OF THE FINGER

Is composed of the roller known as the finger bandage, which is only one inch wide, of the requisite length, say one yard, and split into two ribbons at its terminal extremity.

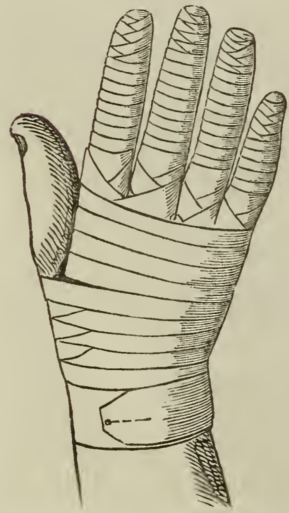
As the spiral turns of this little bandage are employed by every one to retain dressings to the finger in cases of wounds, it may seem unnecessary to offer any directions for its application; but without a turn round the wrist it is very apt to become deranged.

To prevent this it should always be applied as follows:—Fix the initial extremity round the wrist by a circular turn, and cross the back of the hand, in order to descend either finger to its extremity by very oblique turns. Then commencing at the extremity make an ordinary spiral with reverses, and terminate the bandage either by a knot on the fingers, as seen in Fig. 37, or with a few circular turns round the wrist.

### THE SPIRAL OF ALL THE FINGERS, OR GAUNTLET,

Requires a band, eight yards long and of the preceding width, rolled into a cylinder. Then commence, as before, by one or two circular turns around the wrist; pass obliquely over the back of the hand, and descend by oblique turns to the nail of the forefinger, after which ascend by spiral and reversed turns to its base; pass to the middle finger; descend by oblique turns to its nail; ascend by spirals to its base, and so on, till all the fingers are covered, terminating at the base of the little finger. Then pass in front or on the back of the hand, to finish by circulars around the wrist. The last turn in the cut is represented as much too wide; those on the fingers and hand are more correct.

*Fig.* 44.



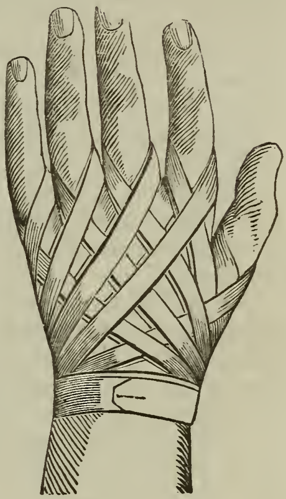
*Use.*—We may resort to this bandage when more than one finger is injured, and there is reason to fear their uniting if they are permitted to come in contact, as in cases of burns. If there is a necessity for retaining dressings at the metacarpal extremities of the fingers, or at the interdigital spaces, we may add to this the Demi-Gauntlet, Double T of the Hands, or the Perforated T, as hereafter shown.

### THE DEMI-GAUNTLET

Is formed of the same pieces as the preceding, and applied by making a few circular turns around the wrist, and then passing across the back or palm of the hand, as the case may be, by oblique turns which will pass from the root of each finger, or its interdigital space, to make a circular turn round the wrist (Fig. 45).

This very light bandage is chiefly useful in retaining dressings on the front or back of the hand. But its place may be supplied by the perforated T, or the double T of the hand, under certain circumstances.

*Fig.* 45.



As the Spiral of the Thigh, of the Leg, of the Foot, and of the Toes, resemble each other, they may all be included in

### THE SPIRAL OF THE LOWER EXTREMITY.

This requires two rollers, each eight yards long and two and a-half inches wide, and that the patient be seated with the extremity of his heel on the very point of the surgeon's knee, or else, lieing down, with the leg supported by assistants. The surgeon being either at the foot or on the outside of the limb, and either sitting or standing, commences by making one or two circular turns from without inwards, immediately above the malleoli, in order to fix the end of the roller. He then descends, if in the right foot, from the external malleolus obliquely across the instep and under the sole to the extremity of the little toe; from this he makes two or three oblique turns upwards so as to cover in the foot as far as the instep, and then covers in the heel by turns of the figure of 8, one extremity of the eight embracing the heel and ankle, the other the instep. After this he ascends the limb by spiral reversed turns, made with either hand, until he reaches the knee; this joint being covered in by a figure of 8, he then proceeds with the second roller to make spiral reversed turns on the thigh, till the whole limb is covered.

*Use.*—This bandage, if well applied, fulfils every indication that can be required of a bandage in fractures, ulcers, varicose veins, or œdema, and will usually keep its place for two or three days without being renewed, if the patient remains in bed. The main difficulty in its application consists in the covering of the heel. This is not, however, absolutely necessary, as in many cases the close adhesion of the integuments to the parts below prevents any great amount of swelling; but where a considerable degree of compression is to be made on the leg, as in the treatment of varices, fistulæ, &c., it is a better plan to cover it. To do this, proceed after the early turns from the inside of the instep, say of the right foot, over the point of the heel; come up over the outside of the instep; down on its inside; under the sole of the heel, folding in the loose edge of the previous turn; then around back of the heel to the internal malleolus; over the front of the ankle; under the sole of the instep; round the back of the heel; over the external malleolus; in front of the ankle; under the instep to the outside of the foot, and then up over the front of the ankle to the internal malleolus; round the back of the leg to its outside, and then up the limb. The turns on the heel and foot, when completed, will resemble those seen in Figure 46. The advantages of the circular turns round the ankle when commencing this bandage are, that it gives greater firmness and prevents the initial end from becoming loose. The French surgeons, however, usually begin to bandage at the toes, and do not cover in the heel, and their course may be followed, by those who prefer it, by observing the rules for the application of

*Fig.* 46.

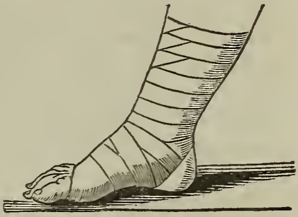
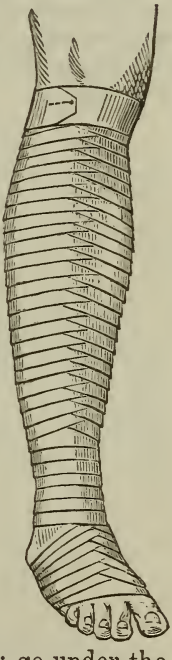


*Fig.* 47.



### THE FRENCH SPIRAL.

This (Fig. 47) is formed by applying a roller two and a-half inches wide and seven yards long, as follows. Place the initial extremity of the roller on the outside of the instep, say of the right foot, and pass obliquely across to the ball of the big toe; go under the sole to the extremity of the little toe; and then make as many spiral reversed turns as will carry the bandage to the front of the ankle, or the front of the astragalus. Pass from this around the malleoli, and ascend the limb by spiral reverses, as in the former bandage. The reverses of this and the former bandage being the same, are shown in Fig. 47, the main difference in the two being in the turns covering the heel, and in the point of commencement.

This bandage is used for the same purposes as the ordinary spiral just described, but especially for the application of the *Dextrine* or *Starch* Bandage, because it leaves the toes and heel open to inspection, which is all important, and will be again referred to in the treatment of fractures. Where it is necessary to make pressure on the instep, heel, or ankle, the Spica of the foot may be added to this (see Fig. 62).

# CHAPTER III.

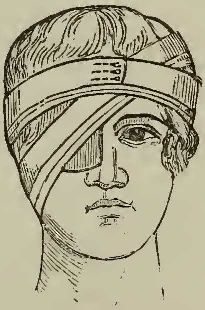
## OF THE CROSSED, OR FIGURE OF 8 BANDAGES.

THESE bandages compose some of the best and neatest applications of the roller, and are named from their shape. As a class they are exceedingly useful in covering in joints and other points requiring firm and solid compression. They may be made either with the single or double-headed roller; though, as the compression resulting from the turns of the latter is sometimes very painful and requires watching, it is seldom employed in this portion of the United States.

### THE CROSSED OF ONE EYE

Is made of a single-headed roller two inches wide and five yards long.

*Fig.* 48.



If the hair is long, cover in the head with a night-cap previous to the application of the bandage, as this will prevent the turns of the roller from slipping. Then make two or three circular turns round the forehead and occiput, passing from right to left if for the left eye, and the reverse if for the right. On reaching the nape of the neck in the third turn carry the roller under the ear of the affected side, and obliquely up over the jaw and injured eye, inclining it well to the internal canthus, so as to cover the root of the nose, but not so as to affect the sound eye. Pass hence, across to the temple of the sound side; descend to the nape of the neck, and make two or three oblique turns, similar to these, terminating the bandage by circular turns around the forehead.

*Use.*—This bandage answers tolerably well to retain dressings to the eye, but is very readily displaced by the movements of the patient, unless pinned fast to the cap first applied. When it is desirable to make pressure on the ball of the eye, as in the treatment of gonorrhœal ophthalmia, cancer, &c., &c., this bandage may prove useful; but the simple circular bandage of the eyes is preferable for simple dressings.

### THE CROSSED OF BOTH EYES

Is made by a single or double headed roller seven yards long and two inches wide, with compresses, if required.

In its application, make two or three circular turns of the head, turning indifferently from right to left, or the reverse; then on reaching the back of the neck pass under the ear of either side, up over the eye, root of nose, and parietal protuberance of the opposite side, to return to the neck. Make two or three turns similar to these, and at the third turn pass from the parietal protuberance round the forehead, instead of round the occiput; cross the root of the nose, the eye, and cheek of the opposite side making an X with the first turns, and proceed in oblique turns as before; terminating by circular ones.

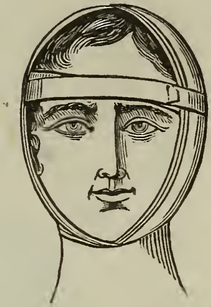
*Uses.*—This bandage, on account of the crossing of the turns on the forehead, is much more solid than the former, and may be employed in similar cases. It will add, however, to its solidity, to cover the head, after its application, with a handkerchief or nightcap.

### THE CROSSED OF THE ANGLE OF THE JAW

Requires a single-headed roller, two inches wide, five yards long, and a thick compress.

In applying it, carry the initial portion of the bandage around the forehead, and fix it by two circular turns of the vault of the cranium, turning from the right to the left and backwards, if the disease is on the left side, and *vice versâ*. From the nape of the neck, direct the roller close under and behind the ear of the sound side; under the jaw to the angle of the jaw on the injured side, and place the compress behind and on this angle. Then carry the roller over the compress, up over the side of the face, between the eye and left ear, obliquely over the vertex, and down behind the ear opposite the injured side. Make thus three or four oblique turns, as seen on the right side of the cut, and terminate by circular turns around the forehead.

*Fig.* 49.

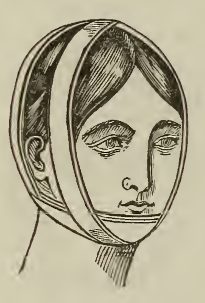


*Use.*—This is an excellent bandage for the treatment of fracture of the neck and angle of the jaw, and the only one that I know of that fulfils the indications for the treatment of this injury; as it forces the angle forward to the anterior portion, and counteracts the action of the pterygoid muscles. It will, also, be found useful in tumours of the parotid region, in retaining dressings to this part. No circular turns should be made around the chin and neck, as sometimes recommended in the treatment of fracture of this part of the jaw, as they tend to displace the fragments, and push the chin too much backwards.

### BARTON'S BANDAGE, OR FIGURE OF 8 OF THE JAW,

Is formed by a single-headed roller five yards long and two inches wide, the initial extremity of which should be placed just below the prominence on the os occipitis. Then continue the roller obliquely over the centre of the parietal bone; across the junction of the coronal and sagittal sutures; over the zygomatic arch; under the chin; and pursue the same direction on the opposite side until you arrive at the back of the head. Pass them obliquely around and parallel to the base of the lower jaw; over the chin, and continue the same course on the other side, till it ends where you commenced; whence it runs exactly as before, a pin being placed at the vertex.

*Fig.* 50.

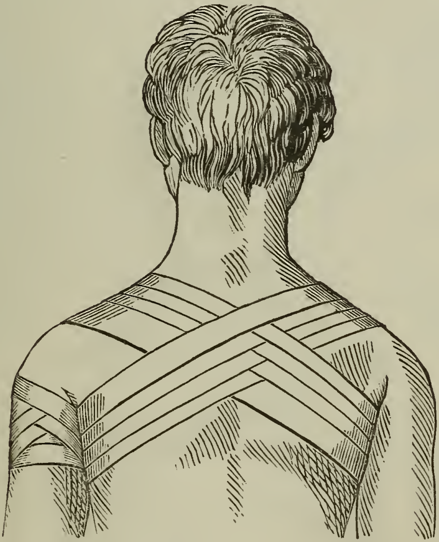


*Use.*—For this beautiful specimen of a bandage we are indebted to the skill and ingenuity of Dr. J. Rhea Barton, of Philadelphia, a surgeon to whom the profession owe many important and novel operations, while his skill in the use of bandages is unsurpassed by any. Although this bandage may be looked on as a small affair compared with some of his improvements, yet it is perhaps the one most likely to be tried by the generality of practitioners, as it is one of the best dressing for fractures of this bone, anterior to its angle. In order to apply it neatly, the roller should not be over *two inches wide*, and the turns should be made to follow as nearly as possible those which have preceded them, so as to give the appearance of but a single turn.

### THE CROSSED, OR POSTERIOR 8 OF THE CHEST,

Requires a roller five yards long, two and a-half or three inches wide, and compresses, tow, or cotton, to place on the anterior edge of the axillæ in order to prevent the bandage from chafing them. Then, whilst the patient is sitting with the shoulders well drawn back by an assistant, and the compresses are held in front of the axillæ, carry the initial extremity of a roller around the superior part of one arm, say the left, and make three or four spiral reversed turns from before backwards, and from within outwards. From this shoulder pass obliquely over the back to the right axilla, the shoulders being well forced backwards.

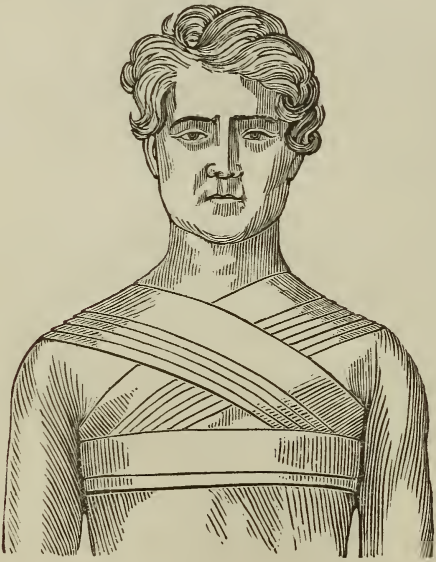
*Fig.* 51.



Ascend in front of, and over the shoulder; pass over the back to the left axilla; over the compresses in front of this axilla and round to the back; over the back to the right axilla; over it in front; and over the back to the left axilla. Pass again the same course till the roller is nearly exhausted, when it may be terminated by circular turns of the body, or of the right arm.

*Use.*—This bandage will act either as a uniting one for the back, or a divisive one for the front of the chest, and was formerly much employed in the treatment of fractured clavicle. But as its place has since been supplied by others which are better, it has consequently fallen into disrepute, though it may occasionally be a useful addition to the means

*Fig.* 52.

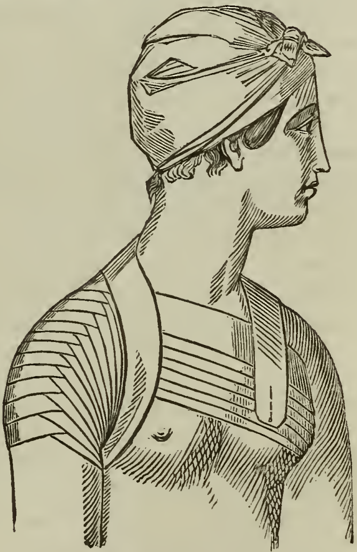


of treating such accidents, when it is requisite to carry the shoulder well backwards. It will also prove useful in uniting longitudinal wounds of the back, or in preventing contractions from burns, &c., on the front of the chest.

### THE ANTERIOR 8, OR CROSSED OF THE FRONT OF THE CHEST,

Is in its action the reverse of the one just described, although its composition is the same. Its application can therefore be readily understood from Fig. 52, and what has been just said. It draws the shoulders forwards, and will, of course, unite longitudinal wounds over the pectoral muscles, or prevent contractions in the cicatrices of burns on the back. By placing compresses over the upper part of the sternum, it may also be usefully employed in injuries of this part, as well as in dislocations anteriorly, of the sternal end of the clavicle.

*Fig.* 53.



### THE SPICA OF THE SHOULDER,

Like most of the spica bandages, forms one of great neatness, and well calculated for making pressure on this part. It is formed by a roller eight yards long and two and a-half inches wide, with cotton or compresses for the axilla of the injured side.

In applying the bandage commence by making one or two spiral reversed turns round the upper part of the arm of the injured side, passing from without inwards, and from before backwards. Then pass from behind the arm, up over the lower extremity of the same shoulder; obliquely downwards, over the front of the chest to the axilla of the sound side; thence round the back; obliquely upwards, over the shoulder, and down in front under the axilla of the injured side, which should be previously furnished with the compress or cotton, in order to protect it. From this point go behind and over the shoulder, to pursue exactly the same course as before, until the bandage is nearly exhausted, each turn covering in, however, only one-third of the preceding turn. Then terminate it by one or two circulars of the trunk, or of the arm, and pin it, as in Fig. 53.

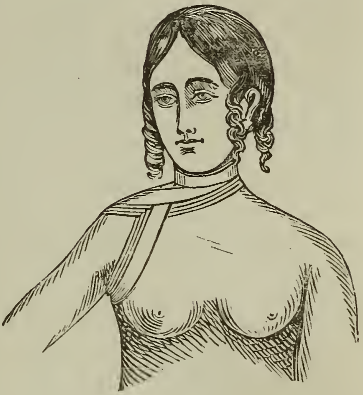
*Uses.*—This beautiful bandage, named from the resemblance in its folds to the arrangement of the leaves of an ear of corn, exercises a very exact compression around the extremity of the shoulder, at a point where it would otherwise be difficult to make pressure. In cases of dislocation of the humeral extremity of the clavicle it will be found of great service in keeping the clavicle reduced, especially if the arm be also well supported. But great care is requisite to protect the edges of the axilla, otherwise they will be injured by the turns of the roller.

When this bandage is made to mount gradually from the point of the shoulder towards the neck it is called a *Spica Ascendens;* but if its turns come from the neck to the shoulder it becomes a *Spica Descendens.* Of course, it is optional with the surgeon to make either the one or the other, as the result depends on the point where the first turn, after leaving the arm, is made to cross the chest.

### THE FIGURE OF 8 OF THE NECK AND AXILLA

Is formed by a roller five yards long and two inches wide, the initial extremity of which is placed on the side of the neck, and fixed by one or two circular turns of the neck, loosely applied; making them, for example, from behind forwards, and from left to right. Next, direct the roller as it comes from the left side of the neck, over and behind the right shoulder, so as to enable it to confine any dressings that may be required either there or in the axilla; then come up in front; over the shoulder; round the neck to the left side; and cover by each turn only one-third of the preceding turns, so as to make a figure of 8, one turn of which shall embrace the neck and the other the axilla.

*Fig.* 54.

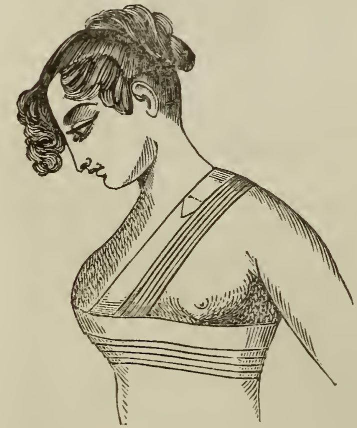


*Uses.*—This bandage will prove useful in retaining dressings before, behind, or above the shoulder, or in the axilla, or at the base of the neck, as it is easily applied, and if not drawn too tight does not restrain the motions of the arm. It may also be made with a double-headed roller, the body of the bandage being applied under the axilla, and the heads crossed upon the shoulder of the opposite side, and then brought round the neck to cross on the shoulder of the injured side. It is firmer, as thus applied, than the single-headed roller, but is apt to press too much on the armpit and interrupt the circulation, or cause cramps in the hand, if care is not used in its application.

### THE CROSSED OF ONE BREAST

Requires a roller eight yards long by two and a-half inches wide; that the patient should be sitting up without the back touching a chair, and that the surgeon should stand in front, or on the outside of the limbs of the patient, and not in front of her knees or behind her back, as the last turns of the bandage are apt to render such a position extremely awkward. In applying this bandage fix the initial extremity of the roller behind the shoulder of the affected side, say the right; then carry it obliquely across the back, over the opposite shoulder, and descend on the front of the chest to pass from before backwards under the breast and axilla of the injured side. Fix by this turn the initial extremity of the roller, and go over the same course once or twice, so as to form two or three obliques of the neck and axilla. Then, on coming to the axilla of the diseased breast the third time, direct the roller transversely across the back, to the axilla of the opposite or left side, and return by a horizontal turn in front of the chest, to the point of departure, in order to commence another

*Fig.* 55.



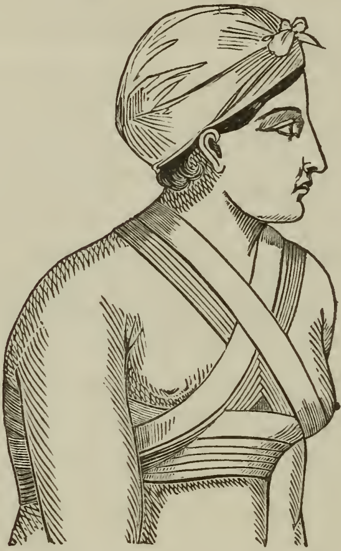
oblique of the neck and axilla. Continue thus making obliques of the neck, and horizontal turns of the body, each turn ascending and covering in one-third of the preceding one till the roller is exhausted, when it will be found that the breast is firmly slung, or supported by the oblique turns, and compressed by the circular (Fig. 55).

*Use.*—This bandage is not only useful in retaining dressings to the breast, but also in supporting the breast itself when requisite, as in cancer, lactation, &c. It will readily keep its place, unless handled, for thirty-six hours. It may, however, if it should be requisite to change the dressing twice or thrice a-day, be supplanted, in cases of simple dressing, by the sling of the breast, as described hereafter, and the patient will thus be saved the fatigue of a re-application of the bandage.

### THE CROSSED OF BOTH BREASTS,

Having more surface to travel over, requires a roller twelve yards long and two and a-half inches wide, rolled either into one or two heads. If the patient is very large it may require a roller of fifteen yards. In order to apply it, carry the initial extremity of a single-headed roller behind the right axilla; thence by crossing the back direct the cylinder over the left shoulder; pass obliquely across the front of the chest, under the right breast, and under the right axilla to the point of departure. Make thus two or three obliques of the neck and axilla, covering in the breast by the gradual ascent of each turn, and on reaching the back of the right axilla in the third turn, pass transversely across the back to the left axilla; under this and across the chest in front of the left breast to the right side of the neck; thence across the back to the left axilla. Make thus two obliques of the neck and this axilla, and on coming to the front of this armpit pass transversely under both breasts to the right axilla, and under this to the point of departure, taking care that each revolution covers successively the breasts from below upwards, without being drawn too tight. If the course here laid down be rigorously followed, we shall have an oblique of the neck and each axilla, with horizontal turns before and behind, so that each turn of the roller will be found to mould itself with great accuracy to the roundness of the breasts and make gentle and equable pressure on them, a point of some importance in certain cases of mammary abscess.

*Fig.* 56.

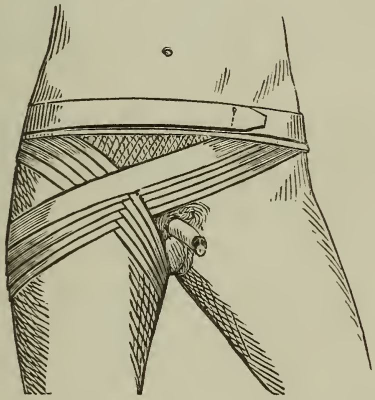


*Use.*—This bandage, like the preceding one, is employed to support or compress both breasts, and is exceedingly useful in patients who are annoyed by pendulous mammæ during lactation, &c. It may, however, be as well applied by using a double-headed roller. In this case, place the body of the bandage in front of the sternum, and carry each cylinder under its respective axilla to form an oblique of the neck and axilla, crossing on the back. After one or two obliques, carry one cylinder horizontally in front of, the other horizontally behind the chest, to make a half transverse turn, and then make other oblique and semi-transverse turns of the body till the whole is covered.

### THE SPICA OF THE GROIN, OR FIGURE OF 8 OF THE PELVIS AND THIGH,

Requires a single-headed roller eight or ten yards long, three inches wide, and compresses.

*Fig.* 57.



Having arranged the dressing, place the initial extremity of the bandage above one of the iliac crests, and make two horizontal turns around the pelvis, in order to fix the point of the bandage, turning from right to left, and from before backwards, if for the right groin, and the reverse if for the left. Arriving in front of one of the groins, say the right, descend to the inside of the thigh, between it and the genital organs, and winding round the back part ascend on the outside to cross the first turn; thence to the ileum of the opposite side; across the back and round the pelvis, to follow the same course until the cylinder is nearly exhausted, when the whole may be fastened by a circular turn of the pelvis.

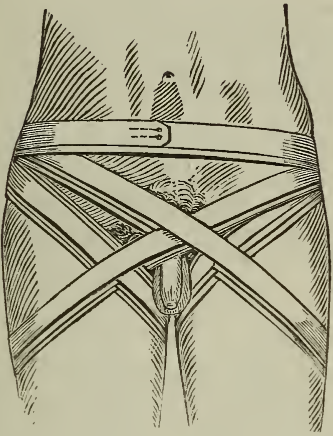
*Use.*—This is an excellent bandage to retain dressings, or make compression on buboes, venereal ulcers, abscesses, &c., situated at the groin. If it is intended to make a Spica Ascendens, the first turn over the groin should go as far down the thigh as the point to be covered by the bandage, and each turn covering in only one-third of that which preceded it should be made to mount gradually upwards. If, on the contrary, it is wished to make pressure from above downwards, the first turn should cross the groin high up, near the abdomen, and each subsequent turn descend, so as to form a Spica Descendens.

This bandage by covering the groin is exceedingly useful after operations for strangulating hernia, or in cases of simple hernia, where compression is required and a truss cannot be borne or obtained.

### THE SPICA OF BOTH GROINS

Is formed by a single-headed roller twelve yards long and two and a-half or three inches wide, two horizontal turns of which should be made about the pelvis, going, for example, from right to left and from before backwards. Upon arriving at the second turn, near the left groin, the head of the roller should be made to pass obliquely downwards along the outer side of this thigh, and to ascend along its inside so as to cross the first descending turn; after which it may be conducted round the back of the pelvis as far as the right groin, and passing hence along the inner side of this thigh, remount on its outer side, and then pass again round the pelvis in front, and to the left; the head of the roller being made to pursue the course just indicated, until only a sufficient quantity remains to terminate the bandage by two horizontal turns of the pelvis.

*Fig.* 58.



*Use.*—Same as the former, but for both groins.

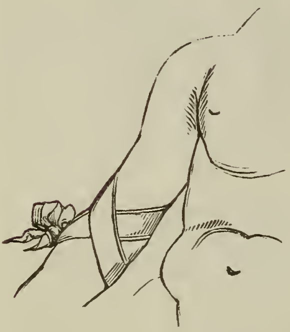
The Spica of both groins may be very advantageously made with a double-headed roller, if the body of the bandage be applied to the front of the abdomen, in a line with the crests of the ilia, and each head be carried so as to cross behind the back and come round on the groins. Then let each head descend in the line of the groin; between the genitals; on the inside of each thigh, and pass under, behind, and on the outside, to run, one to the right the other to the left iliac crest, and thence round the back, following the same course.

No bandages can be firmer or simpler than these Spica bandages, when it is requisite to make firm compression on each groin; but otherwise, as in cases requiring poultices, they will prove inconvenient, from the difficulty consequent on moving the patient in their re-application. For a more simple bandage for this purpose, see the triangular Ŧ of the groin.

### THE FIGURE OF 8 OF THE ELBOW

Is made of a roller two yards long and two or two and a-half inches wide, by placing the initial extremity on the external and upper part of the forearm, and then passing obliquely over the bend of the arm to the internal tuberosity of the humerus; round, above the olecranon to the external tuberosity; thence obliquely across the front, crossing the first turn like an X, to the inner and upper part of the forearm, and then across the back to the point of departure, to run the same course. If the arm is much flexed, make one circular over the point of the elbow, after the formation of the second figure of 8.

*Fig.* 59.



*Use.*—This little bandage, when the arm is either flexed or extended, is very useful in covering in the elbow-joint, and is, therefore, added to the Spiral of the Upper Extremity for this purpose. It is also requently employed to retain the compress used after bleeding, as seen in Fig. 59.

### THE FIGURE OF 8 OF THE WRIST

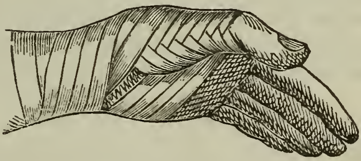
Is made like the preceding, by taking one or two circular turns around the wrist, either on its dorsal or palmar face, then on reaching the cubital side run obliquely across to the space between the thumb and fore-finger, say of the right hand; then obliquely over the palm to a corresponding point on the metacarpal bone of the little finger; hence obliquely across the back of the hand to the wrist-joint; thence make a semi-horizontal turn around the wrist to the ulnar side, and run the same course over again, as seen in the Spiral of the Upper Extremity.

*Use.*—To cover in and compress the wrist-joint. It is also added to the Spiral of the Upper Extremity, in order to cover in this joint.

### THE SPICA OF THE THUMB

Is made by a roller three yards long and a finger's breadth wide, of which the initial end is fixed upon the wrist by two or three circular turns. After the last turn, which should terminate upon the radial side, direct the head of the roller from the external to the internal side of the thumb; pass between the thumb and the index finger; return and cross the base of the thumb, and carry it onward again about the wrist. Repeat these double obliques and cover in about two-thirds of each turn by teh subsequent one, so as to form a spica (Fig. 60).

*Fig.* 60.



*Use.*—This bandage will be found very useful in retaining dislocations of the first metacarpal bone of the thumb, or for making pressure on this part.

### THE FIGURE OF 8 OF BOTH THIGHS

Requires a few turns of a roller two and a-half inches wide, in the ordinary figure of 8.

*Use.*—To keep the thighs together, as after the operation of lithotomy, or after the reduction of a dislocation of the femur.

### THE FIGURE OF 8 OF THE KNEE

Requires a roller two and a-half inches wide, of which the initial extremity is to be fastened by one or two circular turns below the knee. Then pass obliquely over the patella, say from the outside to its inside; make a semi-horizontal turn on the back of the thigh, above the joint, to reach the external condyle; go thence obliquely over the patella to the inner side of the tibia; pass round behind it to the head of the fibula, and run the same course again till all is covered, as seen in the Spiral of the Lower Extremity.

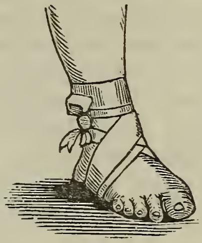
*Use.*—To cover in the knee, or compress the joint. It is also added to the Spiral of the Lower Extremity, in order to cover in this joint, especially in fracture of the patella. If it is wished to retain a dressing to the popliteal space, we have only to reverse the turns of the bandage; that is, start it by circular turns from within, outwards, and cross from below the knee behind, to above it in front.

### THE FIGURE OF 8 OF THE ANKLE AND INSTEP

Is made by a roller two and a-half inches wide, and of the ordinary length.

If in the right foot, place the initial extremity above the external malleolus, and make two circular turns to fix it; then on coming to the external malleolus on the second turn, pass obliquely over the front of the instep to the tarso-metatarsal articulation of the big toe; thence under the sole of the foot to its outside; horizontally over the instep to the same point, and then pass obliquely over to the external side of the os calcis; over this side of the bone, and round its point, up on its inside to cross the anterior extremity of the astragalus; over the upper part of the instep; down the outside at the point of the cuboid bone; under the sole to the inside of the calcis; around its point to the outside, and up over the instep to the point where the cuneiforme internum is placed, and thence follow a similar course till the heel is covered in, which is generally done in two turns and a-half of figures of 8. To cover in the extreme point of the heel be careful that each turn that goes over the sole, is kept as much backwards towards the point of the heel as possible. *The bandage will not slip off*, if drawn moderately tight. The turns may be made as in Fig. 61, or in Fig. 46.

*Fig.* 61.

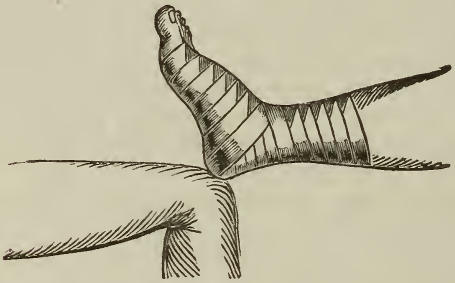


*Use.*—This bandage may be resorted to where we wish to retain dressings to the heel, instep, or front of the ankle-joint, as in excoriations from the extending band of the apparatus for fracture of the thigh. It is also added to the Spiral of the Lower Extremity, when we wish to cover in the heel as well as the whole limb, as in the Compressing Bandage.

### RIBBAIL'S BANDAGE, OR THE SPICA OF THE INSTEP

Is a neat bandage, made of a single headed roller seven yards long and two inches wide, by laying the initial extremity of the roller on the tarsal end of the metatarsal bone of the little toe, if in the right foot, or on that of the big toe, if in the left. Then passing obliquely over the front of the foot to the first joint of the big toe in the right foot, or that of the little toe if in the left, go under the sole of the foot horizontally, in a line with the metatarso-phalangeal articulation, to the outer or inner side of the foot, according to circumstances. From this point make two oblique turns over the front of the foot, which will bring us to the instep on its inner or outer side, and then pass directly to the point of the heel in a line parallel with the sole of the foot, the edge of the roller projecting a little beneath the sole; thence around the heel to come to the instep again, keeping still parallel with the sole of the foot; cross the instep and make another turn similar to the first, which shall embrace the heel and instep, cover in one-third of the preceding turn, and form a spica on the instep (Fig. 62). Continue these turns, gradually ascending, till the foot will hold no more, when we may terminate the bandage by circular turns above the ankle, or else form a spiral up the limb.

*Fig.* 62.



*Use.*—This forms a most excellent and neat bandage for cases requiring firm compression of the instep or ankle, as in wounds of the anterior or posterior tibial arteries at these points. The figure shows the best position of the limb of the patient and of the surgeon. For it, as well as for many other practical details, I am indebted to M. Ribbail, of Paris, from whose excellent course on Minor Surgery much that is of daily service has been gained.

The Figure of 8 of the Toes, or the Spica of the Big Toe, is so precisely similar to such bandages in the fingers and thumb, as not to require a repetition. In applying any of them make a few circulars of the instep instead of the wrist, and then proceed exactly as in the hand.

# CHAPTER IV.

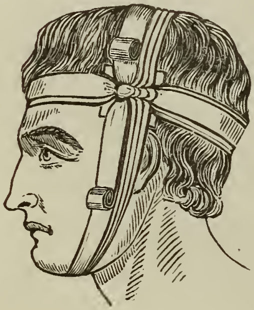
## OF THE KNOTTED BANDAGES.

These bandages, named from their making a knot like that known as the Packer's Knot, are formed by double-headed rollers, and intended to make firm compression on particular points, as on bleeding vessels, &c. The only one of importance is that for the head, which is used to arrest hemorrhage from the temporal artery. Under this class we may, however, with great propriety include all those which are terminated by bow-knots, as the 8 of the elbow after bleeding at the bend of the arm; that of the ankle, as well as the Sailor's Knot, Clovehitch, and others employed in the treatment of Dislocations.

### THE KNOTTED BANDAGE OF THE HEAD

Is made of a band five yards long and two inches wide, rolled up into two heads of unequal size, one being a fourth larger than the other. In applying it, place the body of the bandage over the graduated compress covering the wounded artery, and conduct the two heads one before, and the other behind, to the opposite temple, where they should be reversed, in order to return to the point of departure. Now give them a turn or twist, so as to enable

*Fig.* 63.



one to pass over the summit of the head, and the other underneath the chin, to the sound side. When they meet, reverse them as in the first instance, and from thence conduct them in the same course to the point of departure on the wounded vessel. A second twist being effected, let them pass for the third time to the opposite temple, then for the third time return horizontally, and knotting them firmly, let each knot be placed behind the one first formed; the bandage being then conducted, one head over the vertex and the other underneath the chin, is terminated by a few circular turns of the forehead and occiput.

*Use.*—For arresting hemorrhage of the temporal artery, or any of its branches. It is, however, a painful bandage, in consequence of the compression made on the lower jaw, or on the point of injury. It therefore requires constant attention, lest it remain on too long, or be too tight. It is usual to close the opening in the vessel first with a piece of adhesive plaster, as will be seen hereafter when treating of Arteriotomy.

# CHAPTER V.

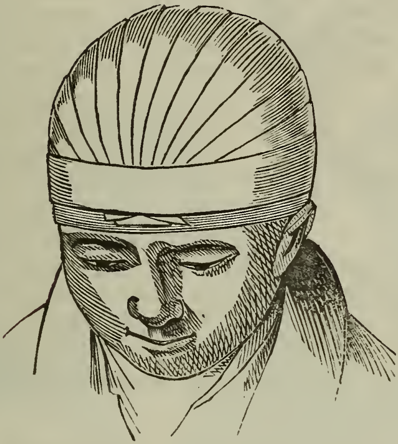
## OF THE RECURRENT BANDAGES.

The Recurrent Bandages are formed by convolutions or parabolic and recurrent turns, which make a kind of cap for the parts to which they are applied. Unlike most caps, however, they are exceedingly apt to become relaxed. Although very neat in their appearance, these bandages require more watching than is convenient, consequently they are often supplanted by other dressings. When required, they may be made either with the single or double-headed roller; but from the difficulty of removing the latter without its coming off in mass, and thus perhaps bringing ligatures, &c., altogether, those formed by the single-headed roller are most generally employed.

### THE RECURRENT OF THE HEAD

Is composed of a single-headed roller five yards long and two inches wide, the initial extremity of which is placed on one side of the head on a line with the supra-orbitary ridge, whilst the cylinder is carried two or three times round the head by circular turns. On coming to the middle of the forehead in the second turn, the bandage should be reversed and the reverse confined with one hand, while the cylinder is carried over the top of the head in the line of the sagittal suture, to the occipital protuberance, reversed here, and there held by an assistant. Then coming obliquely over the head to the forehead, make another reverse to go to the occiput, each turn covering in one-third of the preceding one, and continue thus, till the horizontal turn on the right or left side of the head is reached. Cover the opposite side by similar turns, seeing that each reverse comes to the same point, in front and behind, and terminate the bandage by circular turns, firmly applied around the reversed turns, as in Fig. 64.

*Fig.* 64.

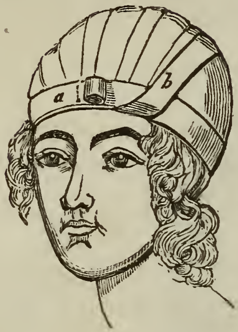


*Use.*—To retain dressings to the head, as in the application of blisters to the scalp—in erysipelas, in wounds, and in other injuries of the scalp, &c. But care must be taken not to draw the horizontal turns too tight, lest, as in the case related by Percy, ulceration or gangrene of the scalp ensue.

### THE RECURRENT OF THE HEAD,

As made by a double-headed roller, requires that the body of the bandage be placed upon the occiput or forehead, so that after two or three circular turns the rollers may be made to intersect each other upon the occiput. One of them is then to be reflected over the vertex to the forehead, while the other continues in a circular course on the side of the head. Then crossing each other upon the forehead, the first head is carried obliquely backwards to the occiput, and reflected by the side of the other, while the last, *a*, is continued in a circular direction. The first, *b*, being again brought over the head, from behind forwards, is to be carried in this way backwards and forwards, in reverses, till the head is entirely covered.

*Fig.* 65.



*Use.*—This, like the previous bandage, serves to confine dressings upon the head, but is now rarely employed for the reasons stated. The ancients, by its means, exerted compression on the heads of Hydrocephalic patients.

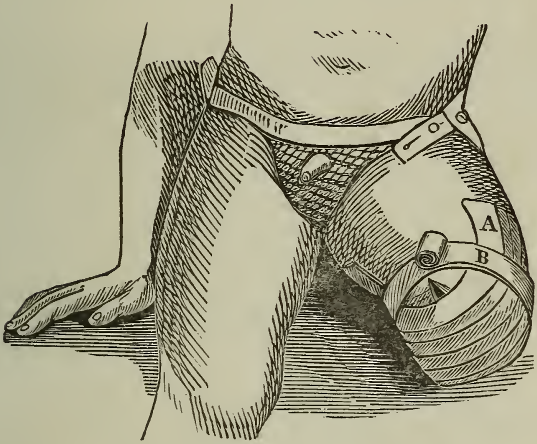
### THE RECURRENT OF AMPUTATIONS

Embraces two varieties, according as it is made with a single or double-headed roller. As, however, it is difficult to remove the latter, I shall only give the application of the former, which is made of a single-headed roller, of different lengths according to the volume of the stump to be covered, but generally two or two and a-half inches wide.

The position of the patient for the application of this bandage should be such as is most easy to him, the stump being well supported and the integuments pushed over the end of the bone by assistants.

Then having arranged the Malteese Cross, and other dressings, place the initial end on the surface of the limb, three or four inches above the extremity of the stump; make two or three circular turns to fix it, and on coming to the central point of the under portion of the limb, reverse the roller, so as to run up in front of the stump and over its upper surface to a point, A (Fig. 66), four or more inches above its extremity. Fix all these reverses by the fingers of one hand, if the size of the limb will permit; if not employ an assistant for the reverses on one side, and continue to make them till the whole face of the stump is covered, when the bandage is to be terminated by spiral reversed turns, which, starting from the circumference of the stump, B, run up a few inches above the first turn of the bandage, and are there confined by a pin. If there is a tendency to spasm of the stump, the ends may be carried on and fixed fast to the pillow or bed on which the limb lies. But care is requisite not to draw the recurrent turns at A too tight, lest by compressing the soft parts

*Fig.* 66.



against the point of the bone they cause irritation and spasm, and create the jerking that is so great an annoyance.

The figure also shows the application of a Suspensory Bandage to the Testicles.

# CHAPTER VI.

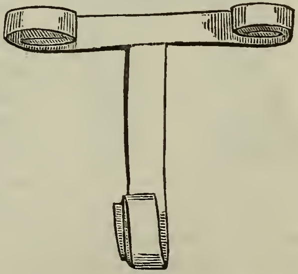
## OF THE COMPOSITION AND APPLICATION OF THE COMPOUND BANDAGE, OR THE BANDAGE PROPER.

It has been already stated, that usage having justified the application of the term Bandage to what should be strictly known only as the Roller, I should describe the Bandage Proper under the head of Compound Bandages.

These include a considerable number of the most useful means of retaining dressings; and as their application is generally simple, though their composition is sometimes a little complicated, I shall pay the most attention to the latter, believing that after they are constructed their application will be simple.

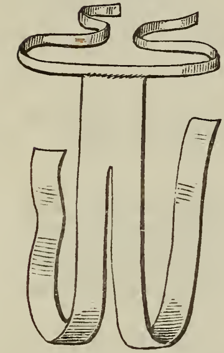
### THE SINGLE T, OR CRUCIAL BANDAGE,

*Fig.* 67.



Named from its shape, is composed of *a horizontal portion*, sufficiently long to go entirely round the part to be covered, and yet leave enough to make a bowknot, and of a *vertical piece*, which is half the length of the horizontal one, and generally attached firmly to its middle, so as to form the perpendicular portion of the T (Fig. 67). Each portion should be rolled into a cylinder, and confined by a pin previous to its application, in order to ensure its smoothness when applied.

Fig. 68.

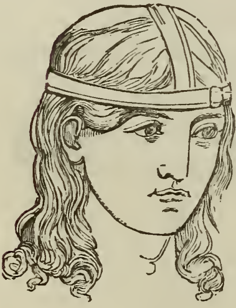


The vertical portion varies considerably in its shape and length. Sometimes there are two vertical pieces, as in the Double T; and sometimes it is three or four inches wide, and slit into two tails to within a short distance of the horizontal band, as in Fig. 68. In others a triangular piece is added, &c., &c., as will be seen hereafter in the special applications of this bandage.

### THE T BANDAGE OF THE HEAD

Requires a horizontal piece of bandage two yards long and two inches wide, upon which, at about one-third of its entire length, a strip half a yard long and of the same width, is stitched at right angles, to form the vertical portion. The bandage then being rolled into two heads, the surgeon places himself before the patient and applies the body of the bandage to the middle of the forehead, with the edge, corresponding to the vertical portion of the bandage, uppermost, in order that the latter, after traversing the vertex, may hang loosely down the nape of the neck. Then passing the remainder of the horizontal portion along the temples to the occipital region, he crosses

Fig. 69.



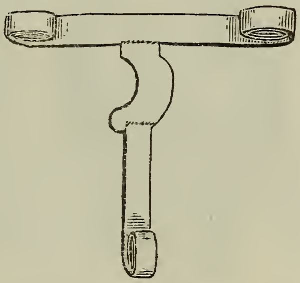
the vertical strip, which should be immediately reflected upwards, and secured upon the brow by the last turns of the horizontal portion. A double T may be formed by stitching a second strip upon the transverse portion of this, at a convenient distance from the first.

*Use.*—This light bandage may be used for retaining dressings to the scalp when the vertical band is so placed that it may run over the point to be covered. Where the dressing is small it is preferable to the recurrent bandage of the head, as it is not so heating.

### THE T BANDAGE OF THE EAR

Is made of a horizontal portion two yards long, of a vertical one a half yard in length, and of a piece of linen of the shape and size of the external ear. Sew the horizontal band to the summit of the ear-shaped piece of muslin, and attach the vertical one to the opposite portion or that corresponding with the soft part of the ear. Then place the circular band around the head above the ear of the affected side, and the muslin over or close behind the ear, and carry the vertical band under the jaw and up on the opposite side, where it will be confined by the horizontal turns.

*Fig.* 70.

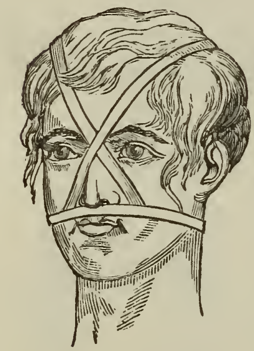


*Use.*—This modification of the T is an excellent bandage for retaining dressings to or behind the ear, especially the latter. Every one has felt the difficulty of retaining blisters or dressings to this part; but the construction of this little bandage removes it entirely. If made of black silk and narrow ribbons, it would hardly be noticed in persons wearing whiskers, or in those wearing caps or bonnets.

### THE DOUBLE T OF THE NOSE

Is made of a band one inch wide and two yards long and of two other bands of the same width, but one yard long, the latter being sewed on the former, so that they may be one inch apart, and at right angles to the first band. After this the transverse band should be placed upon the upper lip, with the border to which the vertical bands are attached turned upwards; and the two extremities being carried over each cheek, and under the ears to the nape of the neck, be there held by an assistant. Then cross the vertical bands upon the root of the nose, and carry each one over the parietal protuberance of its side, and down to near each mastoid process, under the horizontal band. Turn them over this to come upwards, and fix them by bringing the remains of the horizontal band from its crossing on the nape of the neck round the forehead; where they may be fastened either by a knot or a pin (Fig. 71).

*Fig.* 71.



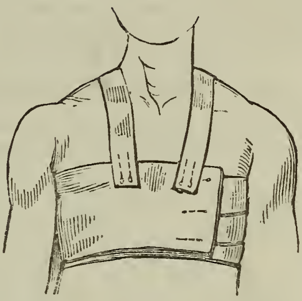
*Uses.*—This little bandage is very useful in retaining dressings to the upper lip and root of the nose, especially in cases of fracture of the bones of the latter, or in epiphora, or fistula-lachrymalis, as it is easily renewed, and does not interfere with the use of the eyes, nose, or mouth; whilst it acts on the part nearly as firmly as adhesive plaster, without being liable to its objection.

The single T bandage of the nose is also a useful mode of retaining dressings to its surface; but as it is much improved by the addition of a suspensory, it will be treated of under the latter bandages.

### THE DOUBLE T OF THE CHEST

May be formed of a broad piece of muslin, and of a band two feet long split nearly to the end; or of two distinct bands of the same length, which are to be attached to its upper edge. Then pass the muslin around the chest, and bringing the two extremities forwards stitch them to the first piece. Or the bands themselves may be brought forward over each shoulder and secured in front, so as to form shoulder-straps. (Fig. 72.)

*Fig.* 72.



*Use.*—In cases of fractures, to compress the ribs, or to retain dressings to the back. Frequently buckles and straps are fastened to the ends in front, and buttons to the upper edge to receive the shoulder-straps; these make the bandage much firmer, but also a little more complicated in its composition.

### THE DOUBLE T OF THE ABDOMEN

Consists of a piece of muslin, to one of the borders of which are stitched, at equal distances from its centre, two narrow bands half a yard long, to serve for thigh or perineal straps. They should be attached sufficiently apart to correspond with the great trochanters.

In its application, the middle of the muslin should be placed around the pelvis, and the extremities brought round on the abdomen, where they overlap and pin. The vertical bands should then be conducted from behind forwards; crossed under the perineum, and fixed upon the forepart of the horizontal band.

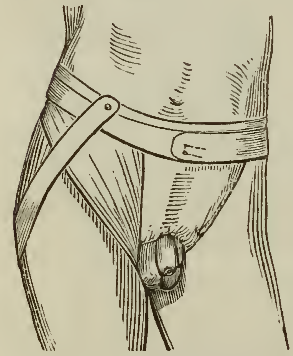
*Use.*—To retain poultices or other dressings to the abdomen; to exert compression on this part after the operation of paracentesis, or after delivery, although its application then belongs rather to the accoucheur than to the surgeon.

This is the reverse of the T of the chest, the vertical bands being made to pass under the pelvis instead of over the shoulder.

### THE TRIANGULAR, OR COMPOUND T OF THE GROIN,

Requires a piece of muslin four inches wide at its base and ten inches long, made of a triangular shape, in order to correspond with the upper and internal part of the thigh. To the base of this sew a horizontal band about a yard and a-half in length; and to its summit a vertical one three-quarters of a yard long.

*Fig* 73.



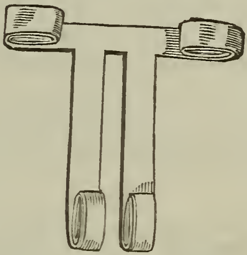
The dressings being then placed on the part, the extremities of the horizontal band are carried round the pelvis on either side as far as the sacrum, whence they are returned and tied in a bow above the pubes, whilst the vertical band and the triangular piece passing down between the thigh and scrotum, the former comes up over the outside of the thigh, and is attached to the transverse portion of the bandage.

*Use.*—To retain dressings upon the groin of a patient confined to bed, as in poulticing buboes, or after operating for hernia. This bandage will be found to be one of the best bandages that we can employ for retaining dressings to the groins in cases where it is requisite to renew them frequently, and especially when it is difficult to move or raise the patient; it being only necessary to untie the vertical band and draw it from under the thigh, in order to lay open the whole groin to our view, which may be readily done without the least movement on his part.

### THE DOUBLE T BANDAGE OF THE BUTTOCK

Requires a roller two yards long and three inches wide, and also two vertical bands each half a yard in length and two inches broad stitched to it at right angles, at about one-fourth of its length. Then the horizontal band being placed around the pelvis, so that the vertical bands may correspond to the median line of its posterior face, its extremities are fixed with pins, and the vertical bands brought under the perineum and fastened to its front portion.

*Fig.* 74.



*Use.*—This is the common double T bandage employed to retain dressings to the perineum, anus, or vagina, in cases of piles, prolapsus ani, and fistulæ. Instead of the two tails, that formed by slitting the single T may be used, as seen in Fig. 68.

### THE T BANDAGE OF THE HAND

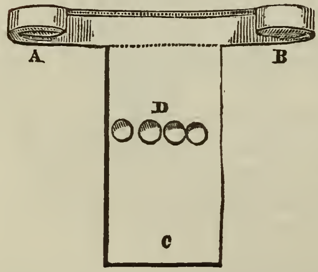
Is composed of a narrow bandage or piece of tape one inch wide and half a yard long; and of a second piece one yard long. Sew the longest piece to the other, in order to form the vertical portion of a T, and place the horizontal band on the back or front of the wrist, so that the vertical band may present to the fingers. Carry the latter portion over the back or front of the hand, over the interdigital space of the first and second finger; come up again to the wrist, and surround it by a half turn of the horizontal piece; reverse the first over the latter to return to the space between the middle and third finger, retaining the dressing, and coming up to the wrist again; surround it again by the horizontal band; reverse the vertical one in order to pass between the ring and little finger, and on the outside of the latter to the wrist, where it may be fastened by the turn round the joint.

*Use.*—This is a very light bandage for retaining dressings to the interdigital spaces, as well as the body of the hand, and offers a substitute for the gauntlet or demi-gauntlet, before seen.

### THE PERFORATED T OF THE HAND

Is made of a two inch roller one yard long, and of a piece of muslin of the breadth, and twice the length, of the palm of the hand. Fold the muslin on itself in its length, and cut in it four circular openings, as at D, about three lines apart, to correspond with the fingers. Then sew one of its extremities at right angles to the roller or horizontal band, as in Fig. 75.

*Fig.* 75.



Pass the fingers through the openings, and stretch the muslin over the back and front of the hand, confining the loose end by a few circular turns of the roller around and above the wrist.

*Use.*—Same as the above.

The T bandages of the Feet being similar in their formation and application to the above, do not require a special description.

# CHAPTER VII.

## OF THE INVAGINATED, OR SLIT AND TAIL BANDAGES.

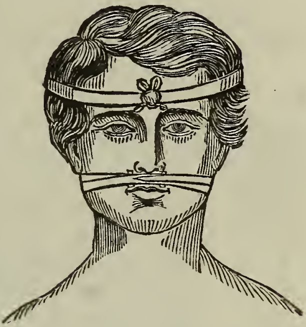
Of the Invaginated Bandages there are two kinds, one, in which the same roller is formed at one end into strips or tails, and at another part into slits or button-holes; the other, in which two distinct bands are thus prepared. In either case, the tails of one part are passed through the openings in the other, and by acting on compresses, approximate all the portions under them. The first is employed to assist the union of longitudinal, the second is used to approximate transverse wounds, as well as in the treatment of certain fractures. When wounds are deeply seated, the application of adhesive strips only causes apposition of the surface and leaves the parts below separated, so that as the secretion of pus continues a bag or cyst is formed, from which the matter cannot escape except by burrowing beneath the tissue. When, also, divided parts have a tendency to contract, they very frequently tear out the stitches, and it is in both these cases that these bandages will be found exceedingly useful.

### THE INVAGINATED BANDAGE, FOR VERTICAL WOUNDS OF THE LIP,

Is composed of a roller two or three yards long and one inch wide, rolled into two heads, and of two small compresses about two inches square, which are to be placed on the cheeks, near the angle of the mouth.

In applying this bandage place the body of the

Fig. 76.



roller on the forehead, or on the nape of the neck near the occiput, and carry each cylinder round under the lower part of the ear, over the malar bones, and over the compresses to the lip. Then slit in one bandage a hole large enough to admit the other roller; pass this through and draw upon each; carry them both round to the nucha, and then run the same course till the parts are well supported and covered in, as in Fig. 76, terminating on the forehead.

*Use.*—In vertical wounds of the lip where other means are not at hand, or to support the hare-lip suture and prevent its cutting out. By the pressure which it makes on the lip, it is also useful in arresting hemorrhage from the coronary arteries.

### THE INVAGINATED OF THE BODY

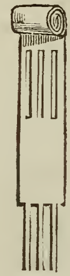
Is composed of a double-headed roller of a length sufficient to go several times round the body, and of two compresses of the length of the wound. The body of the bandage being placed on the back, and the heads brought round under each axilla, and over the compresses on each side of the wound, make a slit in the roller of one side, and pass the cylinder of the other side through it, by which means the wound will be well closed. Continue to do this as often as may be necessary.

*Use.*—To unite longitudinal wounds of the chest or abdomen, or to support the parts after the removal of the breast.

## THE INVAGINATED BANDAGE FOR LONGITUDINAL WOUNDS OF THE EXTREMITIES

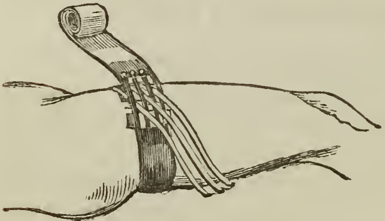
Is made of a piece of linen, sufficiently long to make three or four turns of the part to be treated, and of a breadth corresponding to the length of the wound. Divide this piece so as to form three tails, long enough to embrace three-fourths of the part wounded. At a convenient distance further on, make three longitudinal perforations, opposite to and of the same breadth as the tails. Then roll up the remainder of the band, and make two graduated compresses, of such a size as may be required by the wound.

*Fig.* 77.



If the bandage is to be applied to the upper portion of a limb, its lower part should be first covered by the turns of a spiral bandage, after which the undivided portion, or that situated between the tails and the slits, being applied upon the part which is exactly opposite the wound, and the graduated compresses placed on each side of the latter, at the dis- of about three or four fingers' breadth from its edges, the tails are to be passed through the corresponding slits, and the edges of the wound united by drawing the extremities of the bandage in contrary directions; then secure the tails by turns of the remainder of the roller, or by those of a Spiral one.

*Fig.* 78.



*Use.*—This bandage may be used in deep-seated wounds of the extremities as an adjuvant to adhesive strips, as it unites the deep-seated parts as well as the skin, thus preventing any distension of the inside of the wound, or the formation of an abscess.

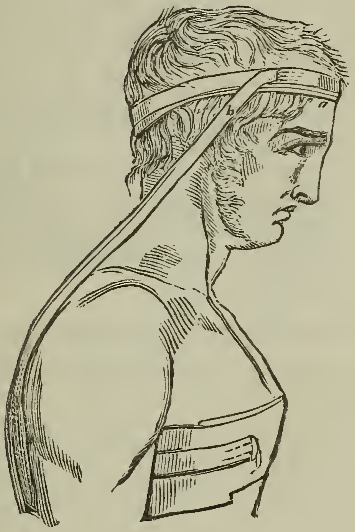
### THE UNITING BANDAGE FOR TRANSVERSE WOUNDS

Will be referred to under the head of Fractures of the Patella.

### THE BANDAGE OF WINSLOW FOR WRY-NECK,

Requires a roller five yards long and two inches wide, and some cotton or pads to protect the posterior fold of the axilla from the last turns of the bandage. The initial extremity of the bandage being then placed just above the mastoid process of the affected side, carry it thence in front of the parietal protu-

*Fig.* 79.



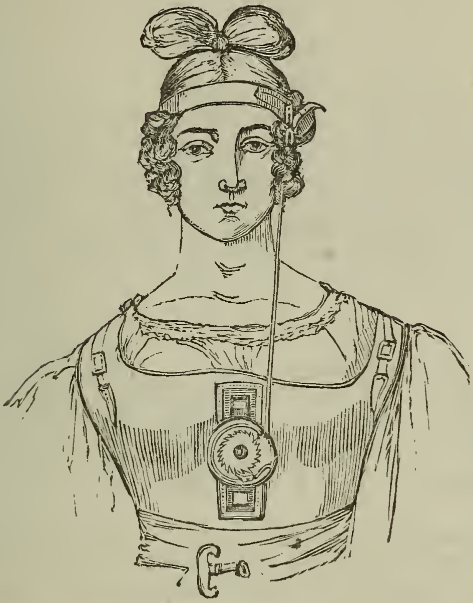
berance of the same side, over the top of the forehead, and then around the head by several circular turns, so as to fix the initial end firmly. Now placing a pin or two in the turns on the forehead, as shown in Fig. 79, pass down behind the axilla of the sound side, over the cotton or compresses previously placed there, round under the axilla to the front of the chest, and see that it is fastened very firmly to the clothing of the patient, or to a band placed around the chest, the head being drawn well over to this side, before the bandage is completed. The turns of the bandage on the head, and the obliquity of its course, from the forehead, behind the shoulder, round to the front of the chest, fulfil the indications of the treatment, by overcoming the inclination to the opposite side and turning the head to the front, thus opposing the action of the sterno-cleido-mastoid muscle of the sound side.

This bandage affords, however, very slight means of acting upon the head, and is apt to slip or stretch. Mechanical contrivances have, therefore, very nearly displaced it, though it is occasionally employed as a temporary dressing.

### APPARATUS OF PROF. JORG, OF LEIPSIC, FOR WRY-NECK.

"This consists of a pair of leather stays and of a band or fillet which goes round the head. On the centre of the forepart of the stays is a kind of pulley or grooved wheel, which can be turned round with a key in one direction but not in the other, as it becomes fixed by means of a spring. From this pulley or wheel proceeds a band up the neck to the fillet on the patient's head, to which it is fastened directly behind the ear, close to the mastoid process. The band lies in the same direction as the lengthened sterno-cleido-mastoideus muscle, and when drawn towards the breast by means of the wheel, produces the same effect as would arise from an increase in the action of that muscle. In short, it pulls the mastoid process downwards and forwards towards the sternum, counteracts the opposite muscle of the same name, and rectifies the position of the head. Professor Jorg makes his patient wear this apparatus day and night, nor does he take it off even when the contracted rigid muscles are rubbed with the liniment that he recommends."[1]

*Fig.* 80.



### THE UNITING BANDAGE FOR TRANSVERSE WOUNDS OF THE NECK

Is very useful in cases of maniacs, or those bent on suicide by cutting their throats. It requires a single-headed roller four yards long; a piece of bandage half a yard long and three inches wide; a bandage for the chest with perineal bands; and a night cap to cover the head.

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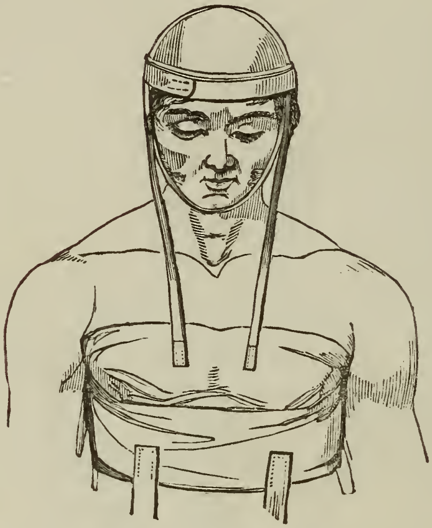
[1] Samuel Cooper's First Lines—by Stevens of New York.

*Fig.* 81.



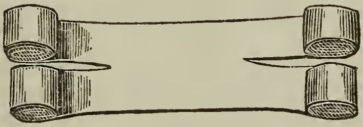
Fasten the cap on the patient's head by a few turns of the roller, and fasten, at the same time, the band by its centre upon the top of the head. The bandage being then applied round the chest and pinned, secure the band by a few more circular turns of the roller, after which its extremities are to be firmly fastened to the forepart of the body, the head being forced down on the chest so as to bring the chin near the top of the sternum.

# CHAPTER VIII.

## OF SLINGS.

Slings are light bandages of great simplicity, and very useful in retaining simple dressings, in consequence of their not oppressing the part to which they are applied. They are formed of pieces of muslin of various lengths and widths, split at each extremity into two or three tails to within a few fingers' breadth of the centre, as seen in Fig. 82. Slings are also occasionally formed of a piece of muslin of a size sufficient to cover the part to which the dressing is to be applied, to each end of which bands are attached to serve as tails; thus making it resemble the ancient slings employed for hurling stones, whence their name. In using the sling, the body or central part is first applied to the part, and then the tails are carried round and confined by knots, or pins.

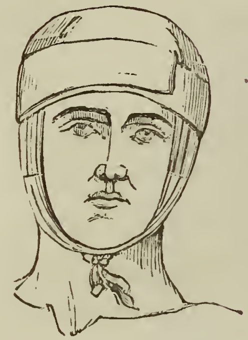
*Fig.* 82.



### THE SLING OF SIX TAILS, OR THE BANDAGE OF GALEN,

Is made of a piece of muslin a yard long and a quarter of a yard wide, split at each end into three tails to within three finger's breadth of the centre, the central tail being somewhat broader than the others. The body of the sling being then placed on the top of the head, the central tails are passed along the ears and secured underneath the chin, the tails being smoothly folded, so as to adapt them better to the lower jaw. The frontal tails are then directed from the anterior to the posterior part of the head, where they overlap each other, while the occipital tails are brought forward and secured by pins, as in Fig. 83.

*Fig.* 83.

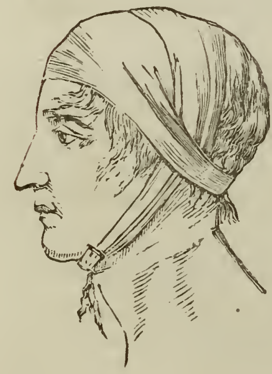


*Use.*—To retain large dressings, as poultices, &c., to the whole scalp.

### THE SLING, OR FOUR-TAILED BANDAGE OF THE HEAD,

Requires a strip of muslin a yard long and six inches broad, split at each end to within three fingers's breadth of the centre. When the wound is on the forehead, the body of the sling is applied there, and the two upper tails carried posteriorly and fixed at the back of the head, whilst the lower tails are fastened either upon the vertex or beneath the chin, as the surgeon may consider most convenient.

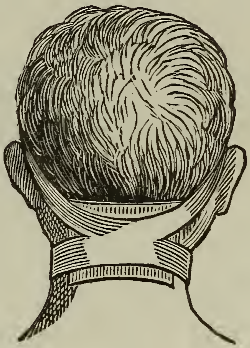
*Fig.* 84.



In order to confine a dressing upon the summit of the head, the posterior tails should be brought down and secured beneath the chin, and the anterior tails, after being carried to the nape of the neck and crossed, should be fixed before the throat, or brought again on the forehead (Fig. 84.)

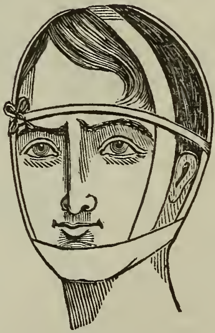
In applying a sling to the nape of the neck, the upper tails are to be conducted over the forehead, from whence, after being made to cross each other, they are returned, and fastened at the occiput; the lower tails passing round the front of the neck. This forms the sling of the neck, as seen in Fig. 85.

*Fig.* 85.



*Uses.*—These bandages are very simple and convenient, and of great utility in wounds of the head or neck, as they can be applied over every point of this portion, by merely changing the direction. On the neck, especially, the sling forms an excellent bandage for retaining blisters, setons, &c.

*Fig.* 86.



THE SLING OF THE CHIN

Requires a piece of muslin six inches by four, slit at each extremity for two inches, to each of which is to be attached a piece of tape or bandage one yard long. Then placing the body of the sling under the jaw, so that the chin may be exactly in its centre, carry the two posterior tails up over the cheeks and vertex to the mastoid process of each side, where an assistant holds them. Then turn the anterior part of the sling and the anterior tails upwards in front of the chin, and carry the front tails under each ear to the nape of the neck; cross them on the neck to come forwards to the forehead, where they may be knotted, after the tails from the mastoids have been carried under their posterior portion.

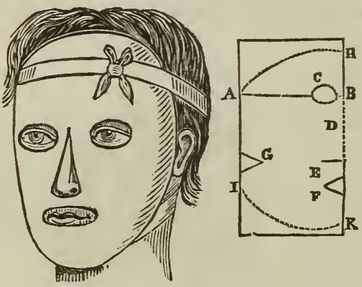
*Uses.*—In fracture of the jaw without displacement, and to retain dressings to the front of the chin, or under the jaw.

### THE SLING OF THE FACE, OR MASK,

Is made of a body piece to fit the face, and of four tails to hold it in its position.

In forming the central portion, fold a piece of muslin, nine or ten inches square, on itself, so as to form an oblong square. Place this on the face so that the double side may correspond exactly with the central line of the face, and mark on it a line, A B, and a circular opening, C, for the eyes. Make also a semicircular, F, for the mouth, and a small transverse cut, E, to correspond with the end of the nose. Then cut off the angles, A H, and I K, so as to give it an oval form, and cut out at G, two triangular pieces, the edges of which are to be sewed together to adapt it to the projection of the cheek bones. Attach two vertical tails at G, and two hori-

*Fig.* 87.



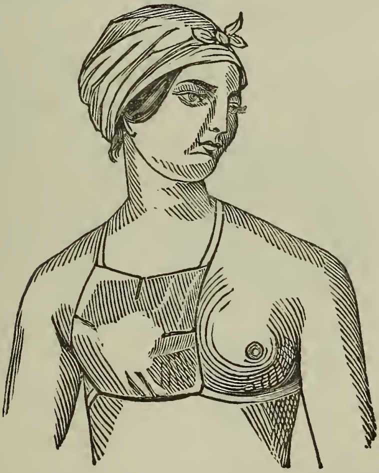
zontal ones at A; then open it out and make a vertical cut, D, from the transverse line at the point of the nose, up to the point between the two eyes, as in Fig. 87. Apply this to the face and carry the upper tails to the occiput; cross them; come round on the forehead, and carry the horizontal tails to the neck, in order to return to the forehead or chin, as in the same figure.

*Use.*—To retain dressings to the whole face, in cases of burns from blasting rocks, gunshot-wounds, erysipelas, small-pox, &c., in all of which it will be found to be a most useful bandage.

### THE SLING OF THE MAMMÆ

Is made of a square piece of muslin sufficiently large to cover in the breast; slit for one inch and a-half on each of its four sides, and of four bands sewed to its

*Fig.* 88.



four angles. These bands must be long enough to go round the chest. Now whilst an assistant supports the breast or retains the dressing, place the body of the sling on the part, and carry the lower tails under each axilla. Come round in front of the chest, and carry the upper tails on each side of the neck, over the shoulder, and fasten them to the horizontal band.

*Use.*—To retain a poultice or other dressing to the breast, or to support it, as in cases of cancer, &c.; but if compression is required, the *Crossed of the Breast* answers better.

This, or the Four-tailed Sling, may also be usefully employed in retaining dressings to the point of the shoulder; the elbow; back and front of wrist; or to the heel and instep. In either of these cases, place the point to be covered in the centre of the body of the sling, and carry the tails round the part, so as to fix the bandage firmly.

## CHAPTER IX.

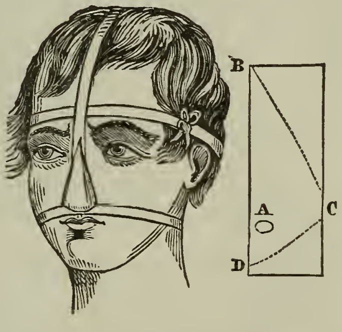
### OF SUSPENSORIES, SHEATHS, AND LACED BANDAGES.

Suspensories are bags of certain sizes, intended to support depending parts, retain dressings to them, or cover such portions as would not otherwise receive a bandage. In all such cases they will be found of great service, and as their manufacture is simple it is surprising that they have not obtained a more general use. As adapted to the nose, &c., I can highly recommend them, to those requiring a complete bandage for such parts.

### THE SUSPENSORY OF THE NOSE

Is used to retain dressings to the whole of this organ, and is composed of a triangular piece, cut from an oblong square as in the dotted lines B C, and C D, of Fig. 89, to the sides of which are attached the vertical and horizontal bands of a single T. In applying the bandage, place the nose within the suspensory, and carry the vertical band over the head to the neck, confining it by the horizontal bands, which are crossed on the nucha; brought up on the forehead, and fastened

*Fig.* 89.

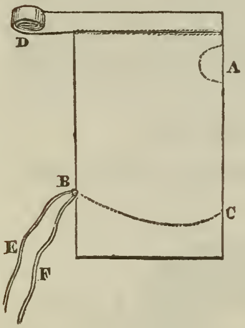


as seen in the cut. The opening at A is to suit the position of the nostril.

### THE SUSPENSORY, OR BAG-TRUSS OF THE SCROTUM,

As found in the shops, consists of a network bag and bands to fasten it (Fig. 66); but as this cannot always be had, its place may be readily supplied by one formed as follows, the application of both being the same. Fold a piece of muslin on itself, of a size to suit the part, say six inches by four, and cut out an opening, A, for the penis, and a curvilinear portion according to the dotted line, B C (Fig. 97). Sew the divided edges of this curved portion together, and attach a horizontal band, D, to the upper part, and two vertical ones, E F, to the lower posterior angle, making an opening or button-hole in the end of each band. Sew on two buttons to the horizontal band, to serve for the attachment of the vertical or perineal straps. Then the penis being engaged in the opening, A, and the scrotum perfectly enveloped, the belt should be carried round the pelvis; returned in front, and tied above the pubes. The two vertical bands are then made to ascend from the perineum along the inferior border of the glutei muscles, and buttoned to the belt in front.

*Fig.* 90.



*Use.*—To support and confine dressings upon the scrotum, or to serve as points of attachment to other apparatus, or for the treatment of swelled testicle, hydrocele, and irreducible scrotal hernia. This bandage should, also, always be worn during the treatment of acute gonorrhœa, as it diminishes the liability to epididymitis.

### SHEATHS

Are coverings intended to retain dressings to the penis, fingers, and toes. They are the finger-stalls of domestic use, and employed daily by every one who has a cut finger. A very useful application of them by the surgeon can be made in cases of gonorrhœa, as when made of large size they will readily retain a portion of charpie on the head of the penis, and by absorbing the discharge prevent its staining the linen. They are also very useful in retaining poultices to the head of the penis, or dressings to chancres, &c., in consequence of their not being easily deranged by erections. The band in such cases passes round the hips, as it does around the wrist when applied to the finger.

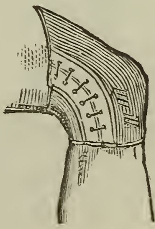
### THE LACED OR BUCKLED BANDAGES

Are so named from the manner in which they are confined to the part. As they are usually obtained from the glovers, or bandage makers, I shall only refer to them in passing. Their application being very simple, and the discovery of them somewhat ancient, their use is generally understood.

### THE LACED BANDAGE FOR THE KNEE

Is made of any elastic substance, such as buckskin or kid, lined with caoutchouc, &c., and laced at the side, as seen in Fig. 91. It is sometimes employed where constant compression is required, as after dislocations of the patella; in chronic enlargements of the joints, &c. When wanted they should be made to order, as their utility depends on the accuracy with which they fit. They may be found at the cutlers, or druggists, generally.

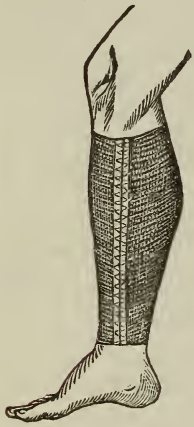
*Fig.* 91.



### THE LACED STOCKING

Is employed in the treatment of varicose veins; for the support of tender and extensive cicatrices of the leg; and in old ulcers, &c., being occasionally preferable in these cases to the ordinary bandage, as it presses uniformly throughout its whole extent; may be readily applied by the patient, and worn under a boot. Where this bandage cannot be obtained ready made, slit a common strong cotton stocking down the side, and hem in on each edge a *very thin* slip of whale-bone. Then work a few eyelet-holes along the edges behind the bones, as in the corsets of the female, and fasten it up by lacings (Fig. 92).

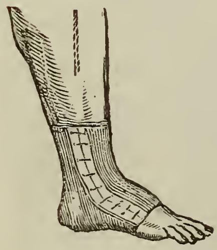
*Fig.* 92.



### THE LACED GAITER FOR THE FOOT

Is constructed like the knee-cap, of buckskin, cloth, kid, and laces along the outside of the foot and ankle, as in that daily worn over a shoe. It serves admirably for supporting the parts after sprains, or weakness of the lower portion of the leg and foot; in the cure of old ulcers on the malleoli, and of œdematous swellings of the ankle generally (Fig. 93).

*Fig.* 93.



# PART SECOND.

## CHAPTER I.

### OF THE HANDKERCHIEF SYSTEM OF M. MAYOR, OR THE SYSTEM OF PROVISIONAL DRESSINGS.

Before taking up the consideration of bandages as applicable to particular injuries, it will not perhaps prove uninteresting to examine the provisional system of M. Mayor, or the system in which he proposes and practices the employment of such simple means as are always at hand, or which may often supplant, with advantage, the means already mentioned, and supply their place whenever they cannot be obtained. "The more readily we can procure such means, the greater also their simplicity and uniformity, the less embarrassing will it be for the surgeon to fulfil his duties, the less perilous will be the progress of the treatment, and the less doubtful the chances of its termination. These observations apply with particular force to the circumstances in which surgeons are often placed, especially when practising among the poorer classes, in the country, in thinly-peopled districts, or in the army or navy, where hospital stores have failed or are rapidly diminishing." In doing this, M. Mayor has made such a simplification of surgical apparatus, that under any, even the most disadvantageous circumstances, relief may be afforded, and a plan of cure employed as safe and as commodious as that generally recommended.

The principle he has laid down is, to use his own words:—"To reduce as much as possible all kinds of apparatus to their most simple principles, by making them dependent upon particular and uniform ideas: in order that the parts of such apparatus, or the material objects of any dressing, may be so common, and of such a nature, as to be met with under every or nearly every circumstance, no less at the disposition always of the surgeon than of other persons; and that, *in the absence* of a scientific man, they may be applied with facility by the *first comer*, after very little instruction. In other words, to find out a means, simple, easy of application, ever at hand, or at least always to be obtained, which may replace lint, compresses, bandages, and ligatures, such as surgery ordinarily requires for the various species of dressings."[1]

This principle, which is certainly correct, is the one M. Mayor has the credit of prosecuting to perfection, although for many years exposed to the sneers and ridicule of his professional brethren. As his plan of treatment is daily becoming better known, his system is now meeting with the respect to which by its merits it is entitled.

As it would be impossible, in my present limits, to treat at length of all this surgeon's objections to the common modes of dressing and bandaging, or give the fullest details of his method of treatment, I will only refer to the more interesting of his matter, believing that many valuable hints may be derived from it, even by those who would not feel inclined to abandon altogether the older and more scientific methods employed in the treatment of surgical accidents.

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[1] *Nouveau Système de Deligation Chirurgicale*, Paris, 1838, p. 16, Introduction. Troisème edition, avec un Atlas.

It has not been M. Mayor's object, as he expressly says, "to banish wholly from the domain of surgery, charpie, lint, bands, &c., notwithstanding that such would be rigorously possible; but he has been so often struck with their abuse and their almost exclusive employment, that he could not forbear exposing their numerous inconveniences in practice, and endeavouring to establish his own motives for what he admits to be their *quasi-exclusion*."

The principal objection which he makes to the common bandage, "is in relation to its frequent absence in time of need; the occasional impossibility of procuring it, and the serious inconveniences with which its application may be attended when performed by unskilful hands; for even under the best opportunities the habit of applying a bandage requires time, and is susceptible of being speedily lost. Bandages, also, are liable to become relaxed, easily deranged, and *corded*, thus inflicting injury in a variety of ways, and rendering their frequent re-application a matter of essential necessity; their diversity of length and breadth is also more or less perplexing to some; to roll them well is troublesome; and when to these well-founded objections to their exclusive employment is added the difficulty of having them always clean and neat, as well, also, as the little care that patients take of them when they are not absolutely wanted, it must be evident that some other means are requisite to rid the surgeon of so many causes of vexation and embarrassment; and that, when such are found, they must be hailed by the profession with something like satisfaction.

"Now, all the inconveniences here spoken of may be avoided; and all the good desired obtained, from a bandage either of the original form of a cravat or pocket handkerchief, or of the principal modifications of this, adapted to the nature of the case." M. Mayor makes four modifications of a handkerchief or cravat-shaped piece of linen, subservient to all the objects of a bandage; such as the *Oblong*, the *Cravat-shaped*, the *Triangular*, and *Cordiform* handkerchief; the latter being only employed as a substitute for a cord, or strong tie, in certain cases.

None of the objections made to the ordinary bandage can, M. Mayor thinks, be applied to the handkerchief. "It is found everywhere, and under every circumstance; is adapted to its purpose; is not liable to become relaxed or otherwise deranged, and cannot become corded; it is easy to fasten; may be changed and reapplied with the utmost promptitude, as a single circumvolution of it is often equal to a multitude of turns of the common band; is also more economical, as it may always be washed, and made ready to apply to other than to surgical purposes; the thickness and breadth can be varied at will: in short, it is so much the more perfect as it forms one whole, while each turn of a common band, being considered as a piece apart, the derangement of one necessarily entails the derangement of all the rest."

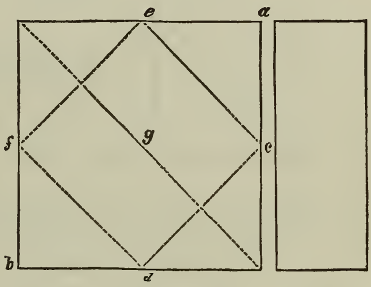
It is not, however, pretended by him, that this new description of bandages can supply, *completely*, the place of common rollers; for, as he justly observes, "there are cases which require a methodic compression of a certain energy, such as affections of the mammæ and of the extremities. But as these are comparatively rare, handkerchiefs should be employed as a general rule, while rollers should form but the exceptions.

In the application of the handkerchief, or triangular piece of linen, M. Mayor commences at the head, and then, as in the present arrangement, proceeds regularly on to the trunk and extremities. In pursuing this course he designates his handkerchief bandages by certain names, which may at first sight appear to be unnecessary and pedantic. But when it is recollected that the arrangement of the name shows the course to be pursued in the application of the handkerchief, it will be seen that its name is a matter of considerable importance, and that it aids us materially in their application; thus, in the *Fronto-Occipital Triangle*, we have the shape of the handkerchief, and the statement of the fact that it is to be first applied to the forehead and then to pass to the occiput; so in the *Fronto-Cervico Labialis* cravat, or the *Occipito-Sternal*, we know that the cravat should cover, first the forehead, then the neck, then the lip; whilst the other should start at the occiput and end at the sternum.

### THE HANDKERCHIEF, OR SQUARE LINEN,

May, according to M. Mayor, replace all the bandages of which I have before treated. In its dimensions, as well as in the tissue composing it, the surgeon must be regulated by the size of the part to which it is to be applied, or the circumstances of the moment. It is, therefore, a matter of indifference whether the handkerchief be of silk, cotton, or linen. If it is too short to go round a part at the time of its application, it may be easily lengthened by attaching to the extremities two pieces of tape or ribbon.

*Fig.* 94.

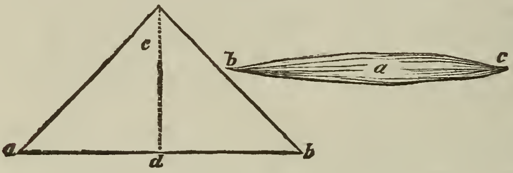


From this original piece he forms all the others, by folding it according to the dotted lines of Fig. 94; thus, if the four angles are folded into the centre, *g*, it makes a smaller square, which may be again reduced by repeating the process. In this shape it answers very well for the application of warm fomenting poultices, which may be thus easily retained between the two layers of the handkerchief. If the square handkerchief is folded from angle to angle it forms a

### TRIANGLE.

This triangle must vary in size according to the part to be covered by it; though the largest of those employed at Lausane is about a yard in length, and a half yard from its summit to the centre of its base. When it is wished to have a smaller triangle, divide this according to the line *c d*, or cut off portions on each side. Thus formed, the parts of the triangle are the Base, *a*, *b ;* the Angles or Extremities, or points of these same letters; and the Summit, *c*. In order to apply it, hold the handkerchief smoothly by the base, placing the thumbs above or on the upper surface, and the fingers widely extended on its under surface; then apply the base first, and carry the extremities around the part so as to cover in the summit, making folds or plaits in any portion that may project.

*Fig.* 95.



The Oblong Square, as seen in Fig. 94, does not require explanation, as it is readily seen to be formed of the common square doubled once on itself.

The Cravat, Fig. 95, is so well known as also to require no explanation, the shape being that which is daily employed in arranging the covering to our necks. Like the triangle, the body, or base, *a*, of the cravat is the part first applied, and this is retained in its position by attaching the ends, *b c*, to the other parts of its body.

The CORD is made by twisting a cravat on itself. It is of great utility in compressing vessels, especially in the Garotte or Spanish windlass, which on an emergency will be found to be a good substitute (see Hemorrhage) for the ordinary tourniquet.

# CHAPTER II.

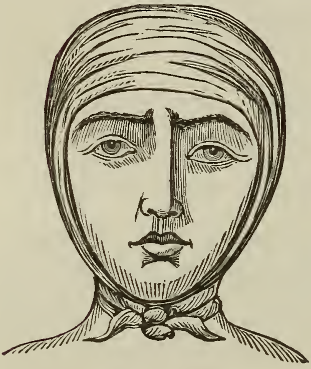
## OF THE HANDKERCHIEFS AS APPLIED TO THE HEAD.

The first application of the handkerchief is to cover in the whole head, and is called

### THE SQUARE CAP OF THE HEAD.

Form the handkerchief into an oblong square, and let the edge of the side to go next the head be two inches shorter than the other. Draw the ends of the long side down the sides of the face, and tie them under the chin; then draw the inner ends, or those of the short side forward, to free them from the former, and then folding them backwards, tie their ends on the occiput.

*Fig.* 96.

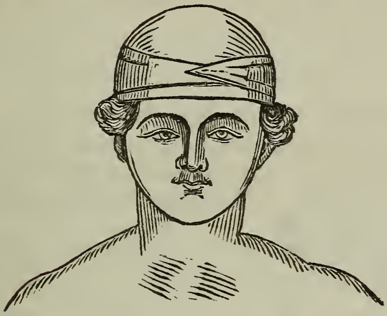


*Use.*—To cover in the head, ears, and jaw.

### IN THE FRONTO-OCCIPTAL TRIANGLE

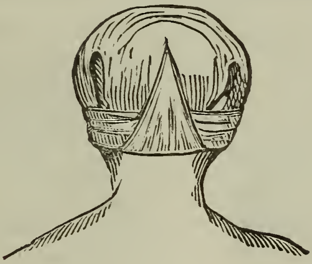
The base is placed before the forehead, higher or lower, according to circumstances, whilst the lateral angles or tails are crossed at the occiput, and then brought forward as far as the temporal regions, or on to the forehead, where they are fixed by means of pins. Fig. 97.

*Fig.* 97.



The summit is then turned over and fastened at the occipital region, by being made to pass under the angles, whence it is reflected upwards and pinned, as in Fig. 98.

*Fig.* 98.



*Use.*—To retain dressings to the head.

FOR THE OCCIPITO-FRONTAL TRIANGLE

Place the base at the occiput; cross the tails upon the forehead, and pass the summit underneath the frontal portion so as to reflect it upwards.

*Use.*—Same as the former, but more useful when pressure may be required on the forehead, as by crossing the angles, or by knotting them, considerable force may be used.

### IN THE BI-TEMPORAL TRIANGLE

The base is placed upon one of the temples, and the summit turned over towards the opposite ear and confined by the angles carried around the head.

*Use.*—To retain dressings to the temples.

### THE SIMPLE OCCULO-OCCIPITAL TRIANGLE

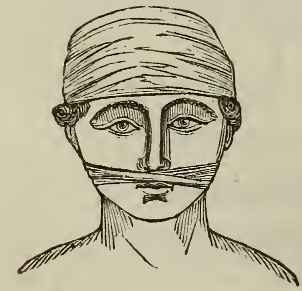
Requires that the base should be stretched obliquely from the superior part of the temporal region of the sound side, over one eye, to the sub-mastoid region of the diseased side; the summit being carried diagonally backwards to the posterior portion, where it crosses at the side of the neck corresponding with the sound eye.

*Use.*—To cover in one eye.

### IN THE FRONTO-OCCIPITO-LABIALIS CRAVAT

Place the body against the forehead; cross the tails on the nape of the neck, and bring them forwards to either lip, where one is to be passed through a slit perforated near the extremity of the other. These extremities being then pulled in contrary directions, over the compresses on each side of the wound, and secured by a couple of small pins or a few stitches under the ears, complete the

*Fig.* 99.



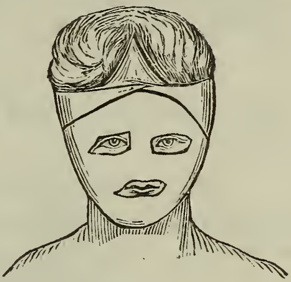
bandage. If a triangular handkerchief is used, the summit should be carried to the occiput, passed under the first inter-crossing, reflected upwards and pinned, as Fig. 99.

*Use.*—To sustain the union in wounds of the lip, or after the hare-lip operation; or to confine dressings, or unite wounds in the absence of other means.

### IN THE FACIAL TRIANGLE, OR MASK,

Place the base of the handkerchief in triangle, under the chin, the summit on the forehead, and carry the angles over the ears to the vertex, where they may be crossed and brought on the forehead, in order to confine the summit. Holes or slits are then to be made for the eyes, nose, and mouth.

*Fig.* 100.



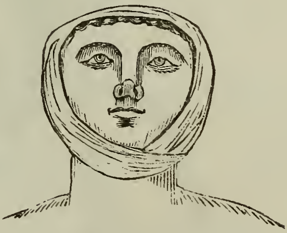
*Use.*—To retain dressings to the face.

### IN THE VERTICO-MENTAL CRAVAT

The body of a broad cravat is placed on the vertex, and the ends carried under the chin and fastened to the sides of the first turn, near the ears.

*Use.* — To retain dressings under the chin, or to the base of the jaw.

*Fig.* 101.

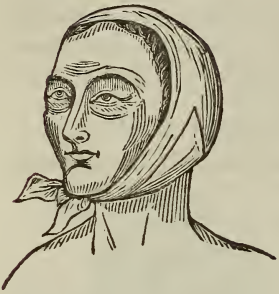


### THE OCCIPITO-AURICULAR TRIANGLE

Is made by the base being placed obliquely in front of the injured ear, whilst the summit is carried round towards the same ear. One angle then going under the jaw of the side affected comes up in front of the opposite ear, where it makes a knot which ties under the ear, or turns around the other angle, so that the two may run round the head, one in front, the other behind, to tie on its side or on the jaw.

*Use.*—To retain dressings to one ear, or to the angle of the jaw, without interfering with the opposite ear (Fig. 102).

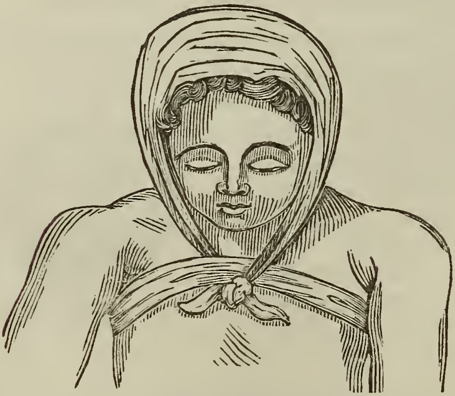
*Fig.* 102.



### THE OCCIPITO-STERNAL HANDKERCHIEF

Requires two handkerchiefs, one in cravat, the other in triangle. Place the base of the triangle on the occiput, with the summit anteriorly, and bring the

*Fig.* 103.



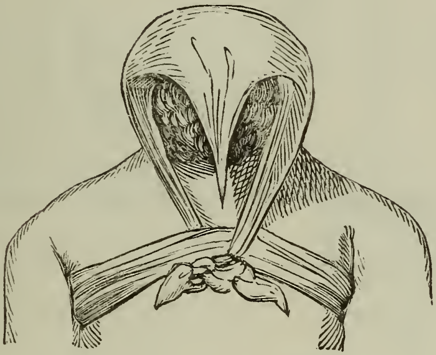
tails down along the sides of the head and face, so as to fasten them to the front of a *sterno-dorsal* or *dorso-thoracic cravat* (Fig. 103).

*Use.*—To unite wounds of the throat, and bring the head to the chest.

### THE FRONTO-DORSAL

Is the reverse of the above. The base of the triangle is upon the forehead, the summit carried posteriorly, and the tails turned downwards and backwards, to be fastened to the back of a *dorso-thoracic cravat* (Fig. 104).

*Fig.* 104.

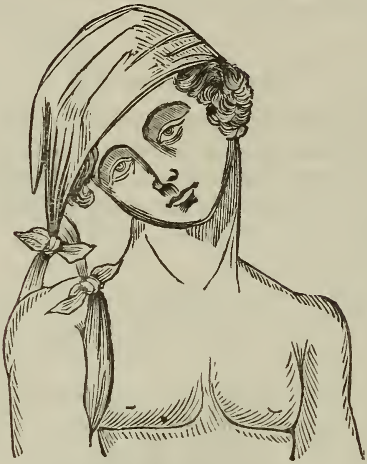


*Use*—Reverse of the former, or to unite wounds of the back of the neck, &c.

### IN THE PARIETO-AXILLARIS

Place the base of the triangular handkerchief on one side of the head, with the summit carried to the opposite side, and tie the ends to an axillo-acromial cravat, as in Fig. 105.

*Fig.* 105.



*Use.*—To bring the head to one side, as in wry-neck, spasm of the sterno-cleido muscle, &c.

# CHAPTER III.

## OF THE HANDKERCHIEFS AS APPLIED TO THE TRUNK.

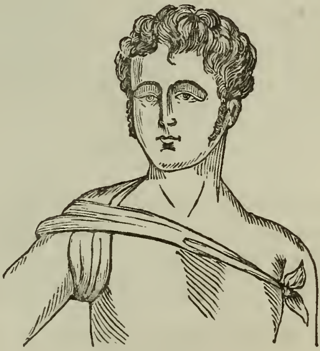
The first of these is very simple, and constitutes

### THE CERVICAL CRAVAT OF DAILY USE,

It has the centre before the larynx, side of the neck, or cervical vertebræ, according to circumstances; constituting an *anterior*, *lateral*, or *posterior cervical cravat.*

*Use.*—As a retaining bandage for dressings applied to the neck. The peculiar shape of the neck, especially at its connection with the chest, is such as to require a bandage to be cut with a slope, like an ordinary neck-handkerchief or stock, in order to fit it, unless we resort invariably to the simple handkerchief just mentioned. As this region will not tolerate compression without a risk of interruption of the course of the blood in the head, the handkerchief generally proves the best method of retaining dressings to this part.

*Fig.* 106.



### IN THE SIMPLE BIS-AXILLARY CRAVAT

Place the centre in the axilla of the affected side;

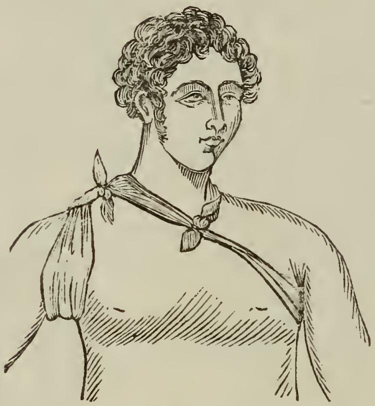
cross the tails over the corresponding shoulder, and then carry them one before, the other round and behind the chest, to the axilla of the opposite side, where they are to be secured (Fig. 106).

*Use.*—To retain dressings to the axilla.

### IN THE COMPOUND BIS-AXILLARY CRAVAT

Place the centre of a cravat on the axilla of the sound side; carry the tails obliquely upwards to the base of the neck at the opposite side, and fasten their extremities; next, apply the centre of a second, and smaller cravat, in the axilla of the affected side, and attach its tails to the corresponding portion of the first (Fig. 107).

*Fig.* 107.



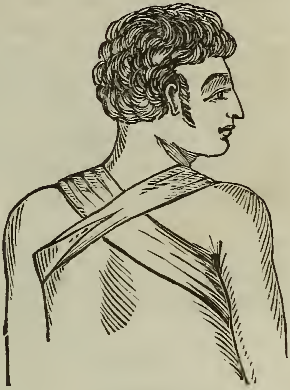
*Use.*—Same as former, but to both axillæ.

### IN THE SIMPLE BIS-AXILLO-SCAPULARY CRAVAT, OR POSTERIOR 8 OF THE SHOULDER

Place the centre between the scapula, carry one of the tails round the corresponding shoulder and axilla. Fasten the extremity by strong stitches to the body of the cravat, and conduct the other tail under the corresponding axilla, and over the shoulder, toward the extremity of the first, upon which it should be similarly secured, as in Fig. 108.

*Use.*—Same as the preceding.

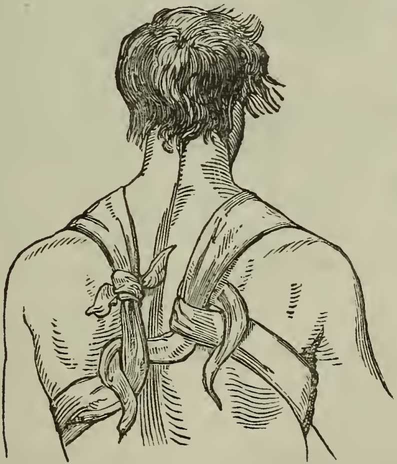
*Fig.* 108.



### IN THE COMPOUND BIS-AXILLO-SCAPULARY CRAVAT

Knot together the two extremities of a cravat about one of the shoulders, so as to make of it a loose ring: next, take a second cravat; apply the centre of this

*Fig.* 109.



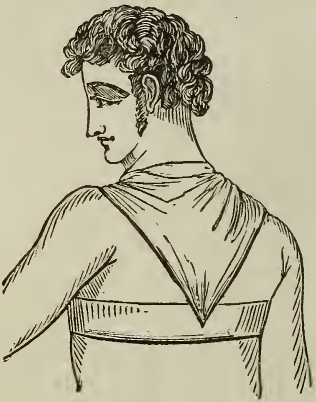
against the anterior face of the other shoulder, and conducting the tails one over the shoulder and the other beneath the axilla, let the first embrace the corresponding portion of the ring, in order that its extremity may be united with that of the second tail, which should be made previously to pass about the first, in the manner represented in Fig. 109.

*Use.*—Same as the two preceding, but preferable to either, on account of the much greater power it may be made to exert.

### FOR THE DORSO-BIS-AXILLARIS

Place one handkerchief in cravat round the chest under each axilla, and the other in triangle on the back, with its base upwards. Fix the summit of the triangle to the circular cravat, and carry the angles over each shoulder and axilla, to fasten to the circular handkerchief behind, and on the sides (Fig. 110).

*Fig.* 110.

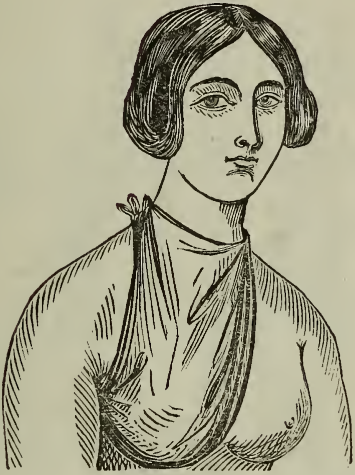


*Use.* — To retain dressings to these parts. If the summit is fixed to the circular cravat in front, and the angles brought over each shoulder to fasten behind, it will retain dressings to the front of the chest, and form a *Cervico-Thoracic Handkerchief.*

### IN THE TRIANGULAR CAP OF THE BREAST

Place the base of a triangle obliquely across the chest under one breast, with the summit over the corresponding shoulder; and carry one angle over the opposite shoulder, and the other under the corresponding axilla, to tie on the back of the shoulder. Then confine the summit.

*Fig.* 111.



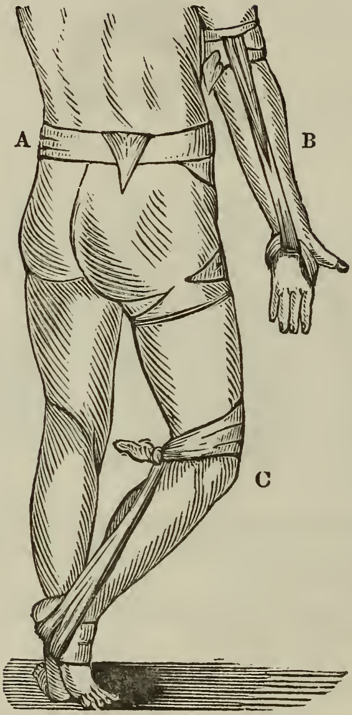
*Use.*—To retain a dressing to, or support the breast during lactation, &c.

### IN THE SUB-FEMORAL HANDKERCHIEF

One handkerchief in cravat goes circularly around the pelvis. The base of another, which is in triangle, is applied obliquely on the thigh, the angles passing circularly around its upper part, and the summit obliquely up between the nates, to be fixed to the circular band, as at A, Fig. 112.

*Use.*—As a means of covering the pelvic portion of the body, and the only one that does it with neatness and accuracy.

*Fig.* 112.



THE INTER-FEMORAL HANDKERCHIEF

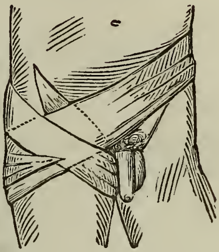
Requires the base on the back of the body; the angles brought round the pelvis; and the summit to be carried over the perineum, to fasten to the angles in front, as in the diapers of children.

### IN THE SINGLE SPICA

Place the body of a cravat in the line of the groin and carry one extremity around the pelvis, the other around and below the thigh, to meet it on the groin. If not long enough, attach tapes to the extremities.

*Use.*—To retain a dressing to one groin.

*Fig.* 113.

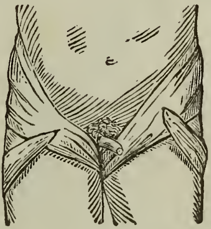


### FOR THE DOUBLE SPICA

Fold two handkerchiefs in cravats, and tie an extremity of each together. Place the knot a little on one side of the spine, and carry the other extremity of each, round over either innominatum, in the line of the groin, between the thighs, and round their outside, to come up and fasten to the bodies of the cravats.

*Use.*—To retain dressings to both groins.

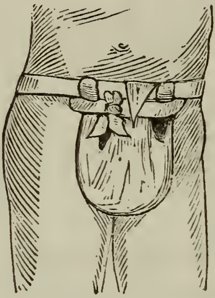
*Fig.* 114.



### TO MAKE THE SUSPENSORY OR SCROTO-LUMBAR TRIANGLE

Form a lombo-abdominal cravat for a belt, and apply the base of a triangle to the under and back part of the scrotum. Carry the tails to the forepart of the belt; pass them about this, from before backward, as represented in Fig. 115, and tie the extremities, so as to bring the knot in front, and prevent its chafing. Next carry the summit upwards, pass it under the transverse portion of the tails and under the belt, reflecting it over the fore-part of the handkerchiefs, so as to secure it with a pin.

*Fig.* 115.



*Use.*—To support the testicles, large scrotal hernia, &c., &c.

# CHAPTER IV.

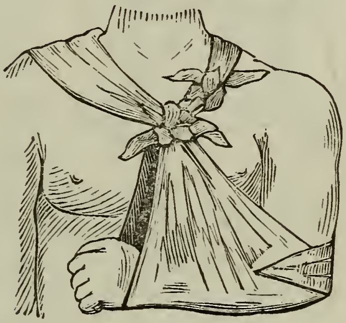
## OF THE HANDKERCHIEFS OF THE UPPER EXTREMITIES.

THE handkerchiefs of the Upper Extremities are an excellent class of bandages, and may frequently supplant the ordinary roller with advantage.

### THE CERVICO-BRACHIAL SLING.

Is made by placing one handkerchief in a cravat around the neck, and knotting its ends over the sternum. Place the other in a triangle under the forearm, so that its base may be next the wrist; then tie its angles to the cravat, and carry the summit around the elbow to fasten it to the body of the triangle in front.

*Fig.* 116.

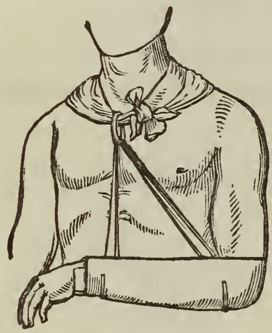


*Use.*—To support the forearm. This method of forming a Sling is better than the common plan, as the knots do not cut the back of the neck, owing to the position of the cravat, whilst the summit of the triangle, being fixed at the elbow, keeps the arm more closely to the side of the body.

### THE ANTE-BRACHIAL TROUGH

May be constructed either of leather or pasteboard, which latter may be covered by some appropriate material with the view of preserving its form, or even giving it a sort of embellishment. It may be either straight, that is to say, open at the level of the elbow, or, as represented in Fig. 117, terminating there in a cul-de-sac. A long riband or cord is required to serve for its suspension, and constitute two collateral bows to which the author applies the term *arc-loops;*—lastly, a cravat, so arranged as to constitute a Cervical Cravat. Four holes being previously bored through the trough at convenient distances apart, near its borders, the cord is run through them, in order to form the loops, which in their passage should be made either to glide through the Cervical Cravat, as represented in Fig. 117, or what is better, through a ring, which serves to connect them, and allows of a free play of the loops; from this the patient will derive no small convenience. When the apparatus is thus prepared, nothing remains to be done but to introduce therein the patient's forearm, which has been, if fractured, previously furnished with its bandage.

*Fig.* 117.

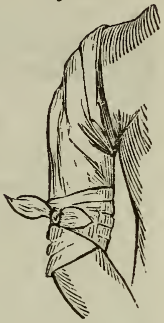


*Use.*—This apparatus may be worn enclosed in the patient's ordinary dress, so as not to give the appearance of the arm being subjected to confinement. But if it be required to preserve the elbow fixed against the trunk, a riband must be made to pass through a couple of holes perforated in the internal portion of the trough, or that which corresponds to the body, and embrace the trunk, as a belt or body-bandage. If it be necessary to give support to the hand or wrist, a thin, flat piece of wood may be laid at the bottom of the trough, and its projection beyond the end of the latter regulated by circumstances.

### IN THE TRIANGULAR CAP OF THE SHOULDER

Place the base of the triangle at the insertion of the deltoid muscle, or elbow; carry the summit over the acromion, and the angles round the arm, tieing them on it as in Fig. 118.

*Fig.* 118.



*Use.*—To retain dressings to the round part of the shoulder or middle of the arm, which it does very perfectly.

### IN THE TRIANGULAR CAP OF THE HUMERUS AND OF AMPUTATIONS

The base of a triangle is to be placed under the limb, at a convenient distance from the extremity of the stump; the tails are then to be brought forward and overlapped, and the summit carried over the stump and fastened to the circular portion, or the angles. In this last part of the process take care that the handkerchief or linen embraces, very accurately, the extremity of the stump, as shown at page 37.

Or, instead of commencing with the lateral angles, the summit may be first carried upwards in the manner described, and then the tails, in encircling the limb, be made to include its extremity.

*Use.*—Whether employed in amputations of the upper or lower limbs, of the fingers or toes, or even of the penis, nothing can be more simple or more effectual than this bandage. In general, no further precaution is necessary than to insist upon the patient remaining quiet; for if the bandage be carefully applied there will be hardly a possibility of any derangement. But should it be absolutely necessary to have recourse to some expedient to prevent the apparatus from becoming detached, a cravat belt may be applied about the neck, or pelvis, the lower part of the arm, or thigh, the wrist, or ankle, according to the seat of operation, and the limb be fastened to this by bands or tapes.

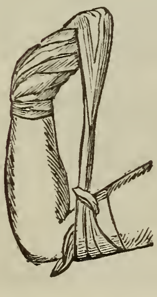
### IN THE CARPO-OLECRANIEN

Fold two handkerchiefs into cravats, and apply one circularly around the arm above the elbow. Then tie an extremity of the other around the articulation of the carpal and metacarpal bones, so that the knot may come on the back of the hand, and attach the other extremity to the circular cravat, as in the arm of Fig. 112. (B.)

*Use.*—To keep the forearm extended. When a splint is passed under each handkerchief on the front of the arm it answers very well in the latter stages of fracture of the olecranon.

### IN THE FLEXOR OF THE WRIST

*Fig.* 119.

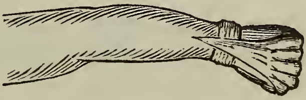


Place a cravat circularly round the arm above the elbow, and a triangle around the hand so that the summit may be folded over, and fastened by one angle around the wrist. Flex the hand and forearm, and attach the other angle to the cravat on the front of the arm, as in Fig. 119.

### FOR THE CARPO-DORSAL, OR PALMAR TRIANGLE,

Place the base of a triangle on the dorsal or palmar surface of the wrist, and carry the angles round this and the summit over the fingers, which should be flexed, as in Fig. 120, if a dorsal handkerchief is wished. If not, slit holes in the handkerchief, as in the perforated T of the hands, and passing the fingers through them attach the summits to the angles.

*Fig.* 120.



*Use.*—To retain dressings to the back or front of the hand, or between the fingers.

# CHAPTER V.

## OF THE HANDKERCHIEFS OF THE LOWER EXTREMITIES.

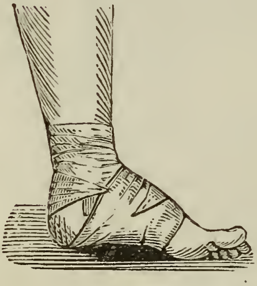
THESE hankerchiefs supply a covering for parts that often embarrass the practitioner to retain dressings on, by any other means. The first is:—

### THE METATARSO-MALLEOLAR CRAVAT.

Place the body of the cravat obliquely across the instep, and carry one extremity round above the malleoli, the other round the sole of the foot and instep, to join it on the front of the ankle.

*Use.*—To retain dressings to this part, as after tying the anterior tibial artery. But where pressure is required, the spica of the instep should be substituted.

*Fig.* 121.



### TO MAKE THE TRIANGULAR CAP OF THE HEEL

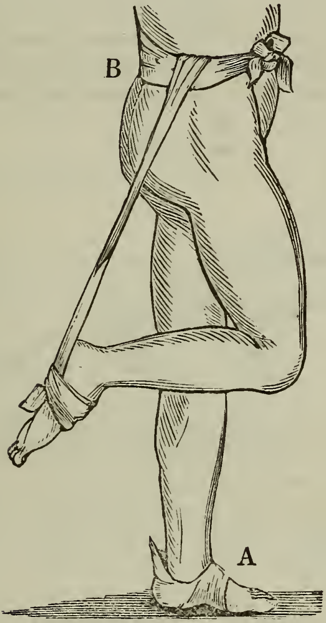
Apply the base of a triangle to the sole of the foot, directly under the instep; carry the summit over one malleolus; cross the angles on the instep, and then carry them around the malleoli to confine the summit, as in the foot of Fig. 122. (A.)

*Use.*—To retain dressings to the heel. This is an excellent bandage in the treatment of the excoriations often consequent on the use of the extending band in the treatment of fractures of the thigh.

### THE TARSO-PELVIEN CRAVAT

Requires one circular cravat around the pelvis, and the body of a second on the top of the foot, with one end tied under the sole and the other fastened to the pelvic band, as at B.

*Fig.* 122.

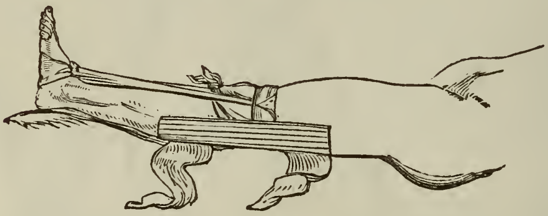


*Use.*—To support the limb and keep the foot extended, as in ruptured tendo-Achillis.

### THE COMPOUND METATARSO-ROTULAR CRAVAT

Is composed of four cravats;—a hollow pasteboard or split deal splint, and some soft compresses. Then the patient's limb being placed in the most complete extension, and the heel kept elevated above the level of the tuber ischi by means of a pillow, the centre of the first cravat is to be applied against the anterior part of the thigh, immediately above the patella, and its extremities carried backward, crossed, and returned to the anterior part of the leg immediately below that bone; by drawing on these, the two broken surfaces will be placed in tolerable apposition. The centre of the second cravat should then be applied against the sole of the foot; one extremity loosely knotted upon the metatarsus, and the other subsequently carried upwards on one side of the knee to the supra-rotular portion of the first cravat, to which it is to be attached, as seen in Fig. 123. The sole of the foot here serves for a point of support; and this second cravat, aided by the respective positions of the leg, of the thigh, and of the pelvis, tends to counterbalance the action of the extensors of the leg. But to obviate still more any possibility of flexion of the latter upon the thigh, which these cravats would not in all instances be enabled of themselves to counteract, recourse is had to a hollow splint, which is well lined with soft compresses, and applied against the posterior surface of the limb. This is fastened in the simplest manner by the two remaining cravats.

*Fig.* 123.



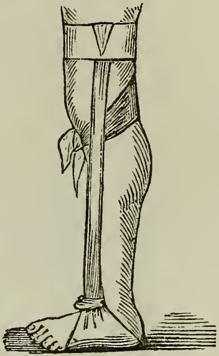
*Use.*—In fractured patella; incised wounds of the knee, &c.

### THE TARSO-PATELLA CRAVAT

Requires one handkerchief in a cravat around the knee in a figure of 8, so as to embrace the patella; the middle of another being under the instep, and one end tied on its outside, the other passed under the cravat at the knee, as in Fig. 124.

*Use.*—In fracture of the patella.

*Fig.* 124.

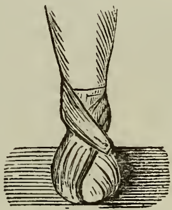


### IN THE MALLEOLAR PHALANGIAL TRIANGLE, OR CAP OF THE FOOT

Place the base of a triangle under the instep; carry the summit over the toes; and the angles around the malleoli, to enclose the whole foot.

*Use.*—To retain dressings to the foot.

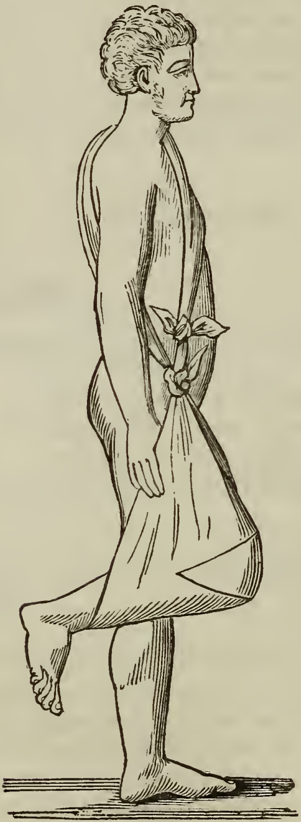
*Fig.* 125.



### IN THE TIBIO-CERVICAL CRAVAT, OR SLING,

Apply the body of a cravat to the shoulder opposite to the side affected, and bring down the tails obliquely, to just above the crest of the ilium of the side corresponding to the injury, so as to give it, when knotted, the appearance of a band. Then, flexing the leg to a right angle, apply a triangle on its anterior face, the base corresponding to the ankle, and the summit to the knee; then carrying the tails, one along the inside and the other along the outside of the thigh, attach their extremities securely to the cervical cravat, near the pelvis.

*Fig.* 126.



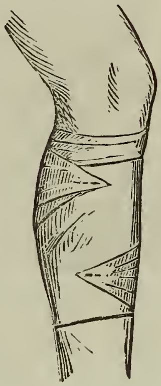
*Use.*—To support the limb after the treatment of fractures of the leg, or in sprains, where the patient is desirous of walking about.

### IN THE TIBIAL CRAVAT

Place the body of a broad cravat obliquely across the back of the leg, and carry one extremity round the leg below the knee, the other above the ankle; to meet and tie, or pin, on the front of the calf, or spine of the tibia.

*Use.*—To confine Sinapisms, Blisters, &c., to the calf. The figure of 8 turns of this handkerchief prevent its becoming deranged by the movements of the patient.[1]

*Fig.* 127.



### BARTON'S HANDKERCHIEF.

A very excellent method of making an extending band for the treatment of fracture of the thigh has been proposed by Dr. J. Rhea Barton, of Philadelphia. Dr. Barton was led to this application of the handkerchief by seeing how well the pressure of the boot on the heel and instep was borne, and how frequently excoriation and troublesome ulceration of the heel followed the use of the ordinary band or gaiter, which pressed directly on the sharp edge of the tendo-Achillis. With these views, he folded a handkerchief into a narrow cravat, and placed the body of it directly on the extremity of the os calcis, below the tendo-Achillis, so that two-thirds of the cravat came round under the outer malleolus, and the other third remained on the inside. The inside portion remaining parallel with the sole of the foot, the outside piece was carried over the instep and passed round it, so as to form a sort of knot. Then passing under the sole of the foot it is turned around the first turn, and form another knot at the metatarsal articulation, when both ends are carried off perpendicularly from the foot and fastened to the splint, the pressure coming directly on the instep and point of the heel, as seen in Fig. 128.

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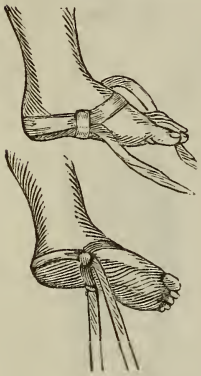
[1] Mayor' Nouveau System.

*Fig.* 128.



When ulceration on the front of the ankle-joint, or on the heel, has been produced by the use of the ordinary means, this will be found to avoid the sore points, and yet keep up a permanent extension.

I have now given an account of the manner in which the Handkerchief is frequently employed as a substitute for the ordinary roller; and therefore pass, in order to preserve the continuity of ideas, to the Hyponarthecia of Mayor, or peculiar means of treating fractures, as described in "Cutler on Bandaging, &c.," including a detailed account of his Clinical Frame; my wish being to offer as great a variety as possible, of the means of treating surgical injuries, in the belief that each one will take from them what is most desirable.

"In 1812, Mr. Sauter published, at Constance, a work entitled 'Instructions for treating safely, commodiously, and without splints, fractures of the extremities, particularly the complicated ones, and those of the neck of the femur, by a method new, easy, simple, and economical.' This work, published in

German, was somewhat voluminous; and in order to render the subject matter more intelligible, M. Mayor translated freely whatever appeared to be the most prominent features of this novel invention, and published them in the work from which his system has been taken. Perceiving fully the advantages that might be derivable from the new system, he adopted it exclusively, and having submitted it to the test of fourteen years' experience and observation both in the Hospital of Lausanne and in his private practice in the Canton, which was very extensive, he published, under the title of 'Mémoire sur l'Hyponarthécia,' the various modifications he had deemed necessary to give to this mode of treatment its greatest efficiency. His reasons for adopting the term Hyponarthécie (υπο, under; ναρθηξ, splint) were based upon the fact that the *planchette*, or Schebmachine, or support of M. Sauter, upon which the limb reposes, was in itself a splint. This term is expressive of the system, and has, therefore, been Anglicised.

"To set out, the problem proposed by M. Sauter, a problem so difficult that it almost seems a paradox, but which he has ably resolved, was '*to treat a broken limb, with even the most serious complications, by position only, and without the use of splints; and to permit the limb, at the same time, to execute, without pain or inconvenience, every movement parallel to the horizon.*'

"This apparatus consists in a board properly cushioned, upon which the injured limb should be placed and fixed in the position which it is necessary to give it. The board thus charged is attached to the ceiling or the top of the bed by means of cords, which are run through holes pierced in its borders and suspended above the bed, so as to render it freely moveable. For the purpose of fastening the limb two or three cravat-shaped ligatures are employed, which, in case of need, and with a certain modification of this apparatus, namely, a foot-board or ladder, will equally serve for the execution of traction or extension. But these ligatures, besides fixing the limb, exert a specific action upon the fragments themselves; for, acting in contrary directions, they keep the fractured ends of the bone themselves as well in juxtaposition as in the most complete immobility: so that this simple contrivance not only effectually produces the necessary traction in the axis itself of the bone, but even similar tractions directly transverse to it; an advantage by which it is distinguished above all other apparatus for fractures. The state of immobility is importantly seconded by the soft cushion, which, by moulding itself to the form of the limb, guarantees the security of its under part, or that which alone can be said to be excluded from the direct action of the transverse ligatures.

"But how, it may be asked, are the involuntary muscular efforts of the limb to be controlled? The answer to this is, that they soon terminate even under ordinary circumstances, and they do so in this case so much the sooner, as they are not stimulated and kept up by the weight or offensive pressure of ordinary apparatus.

"As the whole limb rests exposed to view, the inspection of the practitioner will discover at once the slightest possible displacement, which he will be enabled to remedy with the utmost facility; at the same time that he may employ every kind of therapeutic agent in the event of injury of the soft parts. And the patients possessing, even under the most serious complications of their fractures, the faculty of horizontal motion, their beds can be easily made, and all the other necessary offices readily performed.

"Not the least advantage peculiar to this apparatus is its ready construction; it may be made at all places and under any circumstances, even by the practitioner himself; for if, viewing the materials in detail, some of these may not be at hand, such, for instance, as the pulley for the cords to run through, affixed to the ceiling, or the hinges necessary to a jointed board (see cuts), or a gimblet to bore the necessary holes, substitutes may be instantly found; as a staple for the first, a bit of strong leather for the second, and for the third a few nails, by which the cords may be effectually fixed to the edges of the board. So, also, with respect to the cushion, how many substitutes may be found for this! In short, whether a surgeon be called for in scenes of the greatest poverty, on board ship with the fewest possible resources, or in the wildest districts, he need never be embarrassed.

"On board ship it is especially serviceable, as the fracture is not easily deranged by the motions of the vessel, owing to the limb being allowed to swing as well as the body.

"The reduction of fractures by the employment of this suspension apparatus is effected thus: The board being furnished with its cushion, which should be sufficiently thick to constitute a soft bedding, and entirely cover it, and the vertical cord, forming a loop, properly suspended from the ceiling; the second cord, destined to form the side loops, or arcs of the board, is to be run through the holes perforated through the angles of this, passing in its course through the first or suspension loop, so as to be in readiness to comply with any exigencies, in regard to length, when the suspension is about to be effected. This done, the limb is made to glide along the cushioned board; and then the resistance, or *counter-extension* and traction, is resorted to, together with the coaptation of the fragments; and, by means of the traction-bands, the position and coaptation of the fragments is fairly established. The ladder or foot-board, or extension band, will now keep the foot steadily fixed, while the due elevation given to the centre of the jointed board, if this be used, will constitute it an excellent double-inclined plane, possessed of all the advantages accorded to that species of apparatus. Lastly, the arc-loops and suspension loops are to be regulated so as to raise the limb to a proper height, which will be judged of by the surgeon, in consulting at all times, however, the feelings of the patient.

"As this kind of apparatus is in the way of the bed coverings, some little tact is requisite to overcome this trifling impediment; but nothing need be observed on the subject here, as the good sense of the practitioner will always readily suggest means to remedy an inconvenience so truly unimportant.

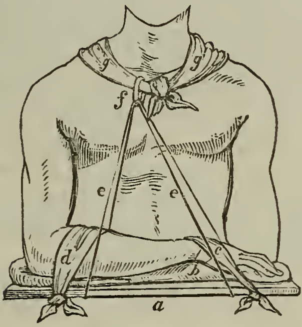
"The use of the jointed board is strikingly evident in fractures of the femur, whether of its shaft or neck: it effects, in its quality of double-inclined plane, that which *modern* surgery only has succeeded in obtaining, namely, permanent *Extension*, joined to double *Flexion*, and the *Fixing* of the entire limb: but, besides this, suspension affords the utmost facility of motion in mass by means of *lateral action*. It will be only necessary to observe this apparatus, as illustrated in the cuts, to be convinced how effectually the above important objects are attained, and how totally impossible it must be for the fragments of the bone to ride in cases of oblique fracture, by reason of the powerful aid of the pelvic bandages.

"Even in fractures of the upper extremities the hyponarthecic apparatus may be sometimes advantageously employed; as, for instance, where the fracture is one of very serious character, and complicated with injuries of the soft parts, which requires that the patient should keep his bed, and which precludes, from what cause soever, the application of ordinary apparatus, as tending to aggravate his sufferings, and augment the difficulties of the case. In short, the only circumstances in which the invention of M. Sauter is contra-indicated are those in which infants or maniacs are concerned, for reasons which the least consideration will render apparent.

### THE ANTE-BRACHIAL HYPONARTHECIA

"Consists in a board of convenient width, a little longer than the forearm and hand;—a cushion; a cord for arc-loops; and three cravats. Then, the fracture being reduced, the forearm is made to repose on the cushioned board, *a b*, which is immediately put into suspension to the patient's neck by means of the arc-loops, *e e*, ring, *f*, and cervical cravat, *g*. The second cravat, *c*, is now passed under the wrist and crossed upon the back of the hand, the tails being then made to embrace the cushioned board, and knotted at its anterior border, as represented in the wood-cut.

*Fig.* 129.



That done, the third cravat, *d*, is made to pass round the apparatus at its upper part, so as to confine the corresponding part of the forearm, and be knotted also at its anterior border. Should it be deemed expedient, a fourth cravat may be made use of, to serve for a traction-band, which will, of course, be knotted at the inner border of the suspension board.

"The advantages that may be derived from the hyponarthecic apparatus may here be judged of; for in cases of fracture complicated with laceration, or other injuries of the soft parts, even occurring at the upper extremities, the wounds remain under the constant inspection of the practitioner, and are not subjected to the incommodious and even dangerous pressure of the common bandage, as must be the case when recourse is had to it under such circumstances. The patient may even be permitted, by the employment of this apparatus, to take exercise when the injuries of the soft parts are not very grave; but if, on the contrary, perfect repose be deemed essentially necessary, instead of the above apparatus a board should be procured, which, extending from the axilla to beyond the finger's ends, should be well cushioned, and maintained in place by means of a BIS-AXILLARY CRAVAT. The board may then be put into suspension, and the above cravat adapted to suit the object in view in the following manner:—The centre of the cravat should be applied to the axilla of the sound side, its tails carried before and behind the chest to the opposite shoulder, crossed thereon, and then brought down, one on each side of the deltoid, to the upper part of the board, the extremities being made to pass through a mortise, perforated in each board, in order to be knotted underneath.

"The bands for fixing, and the traction bands, may then be adapted according to the principles of the system.

"With respect to the suspension, in such a case, it may be made either from the ceiling, or the top of an ordinary bed; or if the hospital-bed be employed, as described hereafter, from the *Suspension-Bar* attached thereto. A precaution perhaps not unnecessary to be given with regard to the cushion is, that this should be of sufficient length to allow of its being turned downwards at its upper part, in order to protect the axilla from the pressure of the extremity of the board."

This last apparatus will, of course, be equally applicable to fractures of the humerus, if complicated with severe injuries of the soft parts, but where a carved splint, as spoken of hereafter, can be obtained, it offers such advantages as must prevent frequent recourse being had to this of M. Mayor.

### HYPONARTHECIA FOR THE TREATMENT OF FRACTURES OF THE LOWER EXTREMITY.

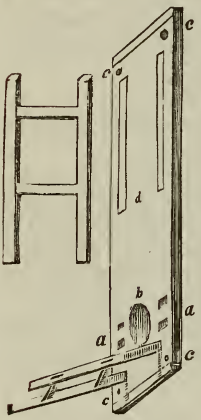
"This consists of a straight board, furnished with a cushion, and suspended something in the manner of a scale-beam, from the ceiling or top of the patient's bed, by means of cords; its object being to give support to a fractured limb, and allow of lateral movement.

"The only thing which distinguishes this from other kinds of apparatus is the suspension. The first thing to be shown is the method of constructing it, and the advantages to be derived from its employment; the next, its adaptation to the limb according to the nature of the injury.

### CONSTRUCTION.

"A thin board must be procured, proportioned in length and breadth to the size of the limb, as in Figure 130; it should be a trifling degree broader, and a few inches longer than the limb. Thus, for fractures of the leg it should extend from the bend of the knee to three or four inches beyond the heel. This board should be covered by a cushion, of its own magnitude, made of oat-chaff, bran, cotton, hair, tow, or, in short, of anything that could answer the same purpose, and be readily procured: and it should have sufficient firmness to afford a plane of some resistance to the limb, and yet be capable of moulding itself exactly to its form. A hole is to be pierced near each of the angles of the board for the passage of the suspension cord, as at *c*. Each end of the cord is then to be introduced through the corresponding holes at one extremity of the board from below upward, and after being drawn to the same length, passed from above downward through the holes of the other extremity, and firmly knotted. The cord will thus form two parallel bows of equal length, which, by being held at the middle, will suspend the board as a perfect plane, or allow of its receiving more or less inclination either way, according to the distance, on one side or other of the centre, upon which the point of support is made to act. The support here spoken of consists of another cord, one end of which is to be carried through a staple driven into the ceiling above the injured limb, and the other made to pass under the collected bows. By pulling, in contrary directions, the extremities of this second cord, the board may be elevated to the necessary degree; and by knotting them, the elevation thus obtained steadily preserved.

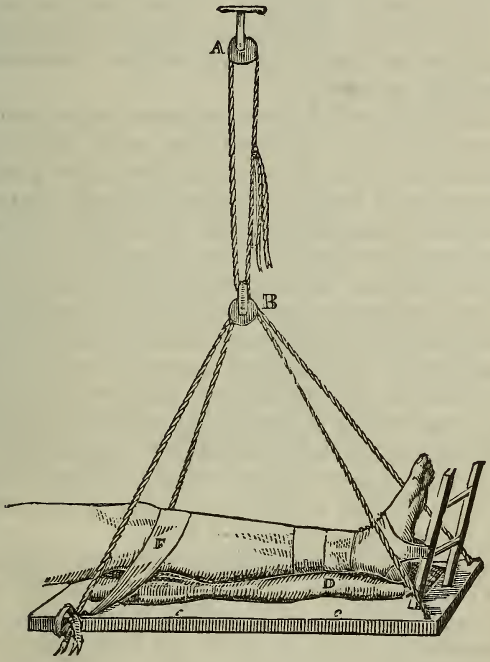
*Fig.* 130.



"Instead of the staple it is better to employ a pulley, if it can be had, as seen in figure 131. A pulley would likewise be found more convenient for the connection of the perpendicular and transverse cords, as seen in the figure at B. The first of these pulleys will afford greater facility in the elevation of the board, while the second will serve to give it the due degree of inclination with but little effort, and without occasioning the slightest shock.

"As the free sliding of the cords would be detrimental to the treatment of this case, from the circumstance of the board being liable to alter its position by the least movement of the patient, it is advisable to tie the two bows together near the pulley, and introduce between the latter and the ligature a small splinter of wood, which will naturally prevent the bows from retrograding.

*Fig.* 131.



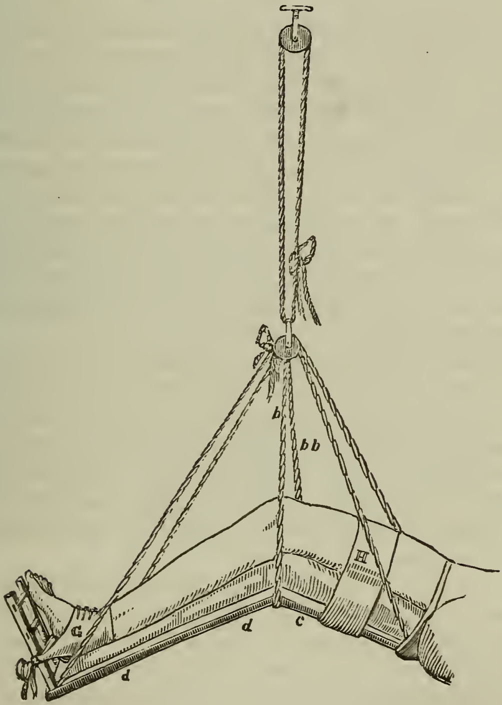
" These preliminary arrangements, with the exception of the introduction of the splinter, or footboard, should be made before the limb is placed upon the board, in order that it may be immediately elevated when the former is applied upon the cushions. Care also should be taken to arrange beforehand the patient's bed, by pressing it down at the part corresponding to the apparatus, in order that his horizontal movements may not be interrupted. As soon as the limb has been elevated to a certain height, it is advisable to place a pillow underneath the board, which should remain there till the fracture is reduced, and the position, &c., of the limb conveniently arranged. This apparatus, when isolated, yields to the slightest impulse imparted by the patient in his movements, without occasioning either shock or pain.

" The facility which patients have of moving themselves in this way is so great, that, as M. Mayor has remarked, they may be seen changing their position with the utmost facility, obeying, through means of the common utensils, the calls of nature, and even gliding upon another bed of equal height.

" Nevertheless, as may be readily conceived, it would be imprudent to permit them to indulge in any inconsiderate movements, as this would occasion and keep up in the osseous fragments a mobility that would become an obstacle to their consolidation. When, therefore, it is found impossible to suppress the indulgence of such imprudent movements, the surgeon must have recourse to the bandage of Scultetus, with the aid of splints, or else to the carved splint, to be spoken of farther on.

" It may thus be seen, that in fractures of the leg, where the suspension apparatus presents the most advantages, a simple board suffices, if it extends from the bend of the knee beyond the heel. A simple board arranged in the same manner, and which, departing from the tuberosity of the ischium would pass a few inches beyond the heel, would also be equally sufficient for a fracture of the shaft of the femur, if it was considered proper to place the limb in an extended position, upon its posterior face; but for those surgeons who prefer the demi-flexion of the leg upon the thigh, and the latter upon the pelvis, the following apparatus becomes indispensably necessary: Two boards must be procured, the one precisely similar to that called *tibial*, of which mention has been already made and represented in Fig. 131; the other *femoral*, as in this figure, extending from

*Fig.* 132.



the ham to the ischiatic tuberosity, and articulating with the preceding, either by means of hinges or simple tapes, which should pass through the holes with which the extremities of these boards are pierced, and be knotted underneath. The suspension of this double inclined plane is effected in the same manner as the simple tibial board, with this difference only, that the two bows are extended from the superior extremity of one of these boards to the inferior extremity of the other. But in order to form the two inclined planes which are to support the limb in demiflexion, a small cord should be passed from below upward, through one of the holes of the upper extremity of the tibial board, as in the figure, across the point of support, and thence, from above downward, through the other hole of the same extremity, under which the two ends should be knotted together. In this way, the extremities of the two boards, corresponding to the bend of the knee, may be made to describe an angle, more or less acute, according as the limb is required to be placed in a greater or less degree of flexion.

"When position alone is sufficient to maintain the fractured extremities of the bone in apposition, and it is indispensably requisite to exert continued extension, or, in short, when more solidity is required to be given to the apparatus, the femoral board should be shaped out at its internal and superior angle, and furnished with a belt, which will be spoken of farther on.

"The boards thus arranged are not only useful in fractures of the shaft of the femur, but also in the treatment of fractures of the neck of that bone; as they fulfil perfectly, in presenting two inclined planes for the flexion of the thigh and leg, the indication of the pillows of Sir Astley Cooper, and the machines of Sir Charles Bell, Earle, Delpech, &c.; which have the inconvenience of being much more complicated, and consequently of less easy and general application, particularly in places distant from large towns. In short, one of the advantages for which the suspension apparatus is deserving of being made known is its simplicity, and its possibility of being constructed at all times, and in all places. In country practice, says M. Mayor, in isolated districts, every portion of this apparatus may be readily procured without occasioning the least embarrassment to the surgeon.

"For myself, I may say," continues this gentleman, "I have never experienced the slightest difficulty. I have sometimes substituted any common bands, when the proper cords failed me; I have nailed these to the board when I have had no instrument to bore the ordinary holes; I have employed nails for screws, and to form the directing bands, tow, wool, or rags; these last materials, as also bran, sawdust, moss, and even soft hay, have served me in constructing my cushions for the boards; the bark of a tree, moistened leather, the binding of an old book, have supplied the place of pasteboard; and rope-ends, skin, or strong cloth, have not unfrequently replaced the metallic hinges.

"The double-boarded apparatus, it may be observed, will be found extremely useful in the case of fracture of the leg, with tendency to displacement, more especially when this occurs near the knee-joint, from the impossibility of applying the garter (*jarretière*), one of the directing bands of which, mention will be made farther on.

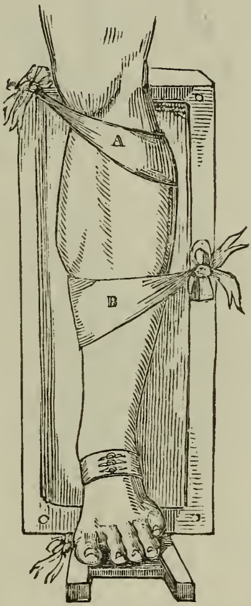
"Although particularly applicable to fractures of the limbs, the suspension apparatus of M. Mayor may, under other circumstances, be of important use. It will readily be conceived how great might be its utility in any painful diseases seated upon one or other of the limbs, as well as in certain white-swellings, in arthritic and rheumatic tumefactions of the foot, or in any other serious affections of the knee, or of the articulation of the foot and leg. Its use might be extended to the treatment of transverse wounds of the thigh, or of the tendo-Achillis, for which the most perfect immobility is indispensable. There cannot be a better means, so long as the immobility of the fractured part is insured, of allowing the patient to vary his position in bed.

### ADAPTATION.

"It is not sufficient, although assertions of this kind have constantly been made, to place a fractured limb, after its reduction, upon an immoveable plane, in order to effect the cure. If this were true, for very simple cases, which would be but exceptions, if, for instance, in the majority of cases of simple fracture of the femur, a convenient position and a retentive bandage might be made to replace all those complicated machines which do more honour to the mechanical knowledge of their inventors than to their knowledge of physiology; it is not the less certain that other means are required also, to maintain the fractured extremities of a bone in perfect contact, to overcome the involuntary as well as the spasmodic contractile efforts of the muscles, and the indocility of the patient. But between these indications, and the necessity of violently extending in contrary ways the two extremities of a limb by mechanical powers which resemble only the rack of the inquisition, there is as wide a distance as between the *glossocôme* of the ancients and the simple pillows of Sir Astley Cooper; the surgeon who does not dare to expose himself to the dangers of the first, or to the insufficiency of the second, has recourse in cases to the extension apparatus of Dessault and others, which are not, however, free from inconvenience, but more often to the simple directing bands of M. Mayor, to which the only real objection that can be made is, that they are sometimes insufficient.

"In the greater number of cases of fractured limbs, the fragments face each other; whence the necessity of exerting pressure in the direction of their diameter, if the displacement exist in relation only to the axis of the body of the bone, or of pulling at the same time at the lower fragment, if the displacement is longitudinal, or in other words, if the broken ends overlap, in order to effect their coaptation. The hands alone of the surgeon and assistant are sufficient to fulfil effectually these indications; but as they are only temporary means, recourse must be had, in order to render the effects permanent during the whole time necessary to the consolidation, to the aid of an

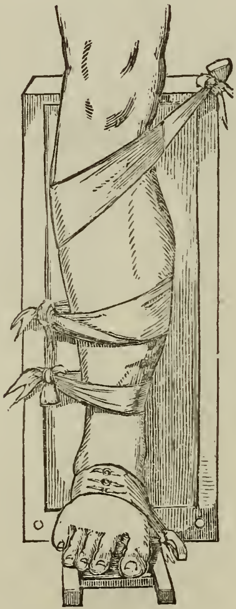
*Fig.* 133.



intelligent machine, if such an expression may be used, which, in accomplishing this end, will in no respect inconvenience the patient.

"Let the fracture of a leg be taken as an instance; if it be of such a nature as not to exact the continued extension of the limb, and position alone suffices to maintain the broken ends in apposition, the surgeon has only to confine himself to the application, below the knee, of a tie or garter, the central portion of which has merely to be applied upon the anterior, or one of the lateral faces of the limb, and its ends attached either separately on each side, or together, on the outside or inside of the board, Fig. 134. The

*Fig.* 134.



object here in view, as will be easily perceived, is to fix the limb upon the board and give a due direction to the superior osseous fragment. The garter, like all the other directing bands, may be made of a bit of common roller, or a longitudinal compress; but M. Mayor prefers those he ordinarily employs. These directing bands, the form of which may be seen in the figure, should be thick and soft, in order to preserve their shape, and prevent them from exercising a painful pressure. They should be constructed of two pieces of linen cloth, from three to five inches wide at the middle, with a layer of wadding, charpie, tow, or wool, interposed between them; to the two extremities of these bands should be sewed tapes of convenient dimensions, or padded handkerchiefs will do as well. The figure indicates so clearly the manner of disposing them that it is unnecessary to dwell upon them longer here: the place, however, they are to occupy upon the limb will be spoken of by-and-by.

"When these simple bands are found insufficient to fix the limb solidly upon the board, or when it is necessary, in order to maintain the fracture reduced, to exert continued traction on the limb, the following pieces must be added: To the inferior extremity of the board above spoken of, a foot-support is to be adapted, of the shape of a ladder, as in Figure 130, by means of mortises, *a a*, pierced in the former to receive it; it should be from eight to ten inches high, and form with the board an angle of about eighty degrees.

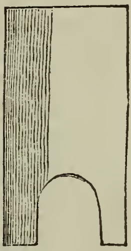
"The object of this foot-board is to fix the heel-strap or ordinary gaiter, which, on one hand, embraces accurately the instep, heel, and malleoli, and on the other, is attached by means of the two tapes, which terminate it, to one of the sides of the ladder, according to the direction desired to be given to the limb.

"Thus, by means of the gaiter on one hand, and the foot-frame and heel-strap on the other, the elongation of the limb may be produced, and the overlapping of the fractured ends effectually prevented. The extension being made, is maintained by the heel-strap, and the counter-extension by the garter, or band at the knee, without taking into account the weight of the body, and the fixture of the limb upon the apparatus; while the heel-strap, by fixing the foot, prevents rotation, inwards or outwards, of the lower fragment.

"But this alone is not sufficient to restore the limb to its natural form when the fragments are displaced in respect to the diameter of the bone; and although the shortening of the bone has been provided against, nothing has yet been done to maintain the fractured ends in apposition. The following is the manner in which this indication is to be fulfilled; instead of rosorting, as is generally the case, to the uniform pressure exerted by the eighteen-tailed bandage, or that of Scultetus, with splints applied upon the soft parts that surround the ends of the bone, M. Mayor has recommended a means much more simple and more efficacious, and one which offers, besides, the advantage of not covering in with the apparatus the part of the limb at which the fracture is seated; permits the surgeon also to visit it as often as he pleases, without the help of an assistant; and to remedy the displacement, if any such should have occurred, as well as to dress the wound, should one exist, without meddling with the apparatus. The means in question consists in placing upon the part of the limb toward which the end of the bone is directed, and where it makes projection, the centre of a directing band, as Fig 133 (B); and fastening the extremities to the opposite side of the board; care being taken, however, to see that the fracture is properly reduced. Two bands, which act in opposite directions, are occasionally necessary, but more frequently the desired effect is obtained by one alone. The middle of the band should be applied upon the most convex part of the deformed limb; one of its extremities is to be passed immediately under it, the other over, and both drawn with sufficient force and fastened to a peg inserted at the side of the board, which corresponds to the concavity of the limb, or in default of this, to a mortise pierced about this spot; they may be even nailed at once to the board.

"The directing bands should not be placed until the heel-strap and garter are adapted, the latter being fixed to the board upon the opposite side to that toward which the neighbouring band is to be directed; without attending to this, the two extremities of the limb would be found to yield to the inverse tractions of the bands. The disposition of these several pieces is seen in the Figures 133, 134. In comminuted fractures with extreme tendency to displacement, a piece of pasteboard should be applied upon the anterior part of the limb, as in Fig. 135, the notched end being intended to touch the front of the foot.

*Fig.* 135.



"To fix the femoral board more solidly the surgeon should apply the large quilted band, or padded handkerchief before spoken of. This band should be of sufficient length to pass as a belt round the body, and terminate by a strap, to be attached to a strap and buckle fixed to the external and superior part of the board. This band serves at once as a body-bandage and perineal strap; it passes first of all upon the groin of the injured side, then round the corresponding ilium and along the back, and is returned over the pubes to the upper part of the fractured thigh, where the buckle, fixed to the outer side of the board, receives it, or where, when this is wanting, it may be fastened to some other convenient point of attachment. This belt, which, as may be perceived, tends to fix securely the femoral board upon the pelvis, is employed with the notched portion of the board, against which the tuberosity of the ischium rests, to produce the counter-extension, or, in other words, the resistance necessary to meet the tractions of the heel-strap; while the latter acts at the same time upon the limb, which it elongates, and upon the board which it pushes upward, first beneath the ham and then upon the ischiatic tuberosity. Lastly, it is this portion of the apparatus which performs the greatest part in the effort; but as it is aided firstly by the weight of the limb, which, placed upon an inclined plane, tends to descend; and secondly, by the effort itself, which tends to elevate the bend of the knee, there can be no reasonable apprehension of the formation of sloughs or excoriations, such as the ordinary machines for continued extension too frequently produce.

"This apparatus appears to unite all the qualities necessary for the reduction and consolidation of fractures of the neck of the femur.

"To resume; when it is required to maintain a reduced fracture of the femur, of whatever nature it may be, whether situated near the knee or in the shaft or neck of the bone, whether simple or complicated, with or without obliquity of the fragments, the thigh and leg are to be extended over the inclined plane, well cushioned, the belt applied round the thigh and pelvis, and the foot attached to the ladder or foot-board inserted in the lower end of the tibial board. A large quilted band, or several handkerchiefs, embrace the whole apparatus to confine the limb upon the board, when there is no deformity; or the bands of direction, already described, made use of when the limb is curved, or there is any tendency to curvature.

"With a view of raising patients in bed, when suffering from injuries to the lower extremities, M. Mayor proposes a Clinical Frame, which, from its simplicity, has many advantages over the complicated machinery of Earle, Jenks, &c., and may be advantageously used, especially by army surgeons, as it offers an excellent bed, under even ordinary circumstances, being more steady, and not liable to the objections of an ordinary hammock.

In speaking of it, he says:—"It is, doubtless, highly gratifying to have at our service, as practitioners, a number of easy and convenient kinds of apparatus, as well as appropriate and salutary therapeutic agents; but there are circumstances in which, if we have the latter at command, the former are by no means so much in our power; whence it happens that we are occasionally called in, under circumstances so perplexing, nay, so truly desperate, that we are content with positive inaction, rather than allow our interference to add to the patient's sufferings.

"A large number of serious affections are daily met with which not only compel the patients to keep their bed, but even place them beyond the possibility of being removed from one part of the bed to the other, without their being subjected to the most excruciating pain, or even to actual danger. Whether they repose then upon a bed of eider-down, or are stretched upon a hard paillasse, these unfortunate individuals soon experience the want of having their bed better arranged, and of being replaced in a position more supportable. They are excoriated at all those places where the bones project, as at the sacrum and the hips; the skin, deprived of its subjacent fatty tissue, constantly and powerfully pressed against the bones, soon becomes irritated, and ultimately sloughs; whence result those deep and extensive wounds, which, incessantly exposed to an invariable, and one might almost say corroding pressure, to the difficulties attendant upon their dressing, and, still worse, to the continual contact of urine and fæcal matter, sometimes finish existence of themselves, or rapidly abridge its duration.

"For the purpose of averting these serious inconveniences various mechanical beds have been invented, the most ingenious of which tend to elevat eentirely, and with great gentleness, the unfortunate sufferers whom it would be impossible to move with the hands or any other means without occasioning the most heart-rending cries.

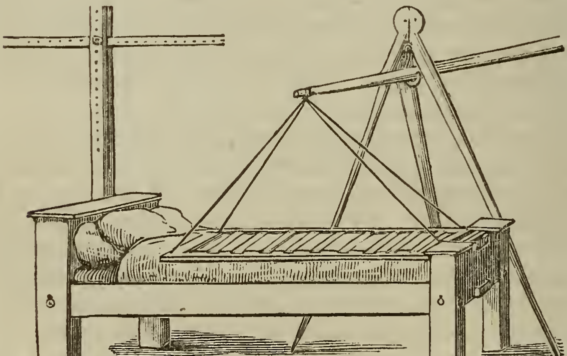
"It will be readily conceived that the hands of one, two, or even three persons, are wholly insufficient to support the entire body of an adult; that the parts which are not sustained must be put upon the stretch, while the others are pushed up, and that, from this unequal manner of action, the most excruciating pains ensue. And let it be, moreover, remarked, that the fingers do injury from their hardness; while, in addition to all this carrying to and fro of the body of the sufferer, the most disagreeable shocks are constantly occasioned, which infinitely augment his already intolerable pain. In point of fact, patients in general prefer supporting the whole of the serious inconveniences allied to their actually invariable and painful position, rather than expose themselves, by this lifting about, to absolute tortures; more especially when this has to be effected frequently.

"Circumstances so melancholy have necessarily had the effect of awakening the solicitude of practioners, the industry of patients themselves, and the compassion of those who are about them to contribute, if possible, to the palliation of such tortures, or at least to attenuate some of their more fatal consequences. But it has been more particularly in favour of the minority, that is to say, of the opulent, that such efforts have been crowned with success; the lower orders of society still remaining without the pale of benefits arising from the invention of machines calculated to be of avail in circumstances such as those just pointed out. The reason of this is evident; the means indicated, and known under the title of Mechanical Beds, are so complicated and so costly, that they can only be within reach of persons in easy circumstances; and even in hospitals these beds are generally few in number, and their use very limited.

"So great, therefore, is the difficulty of obtaining these different kinds of apparatus, and still more the difficulty of adapting them to the exigencies of the most numerous classes of the community—classes which, be it observed, are the most constantly exposed to affections demanding contrivances of this kind—that it has been of the utmost consequence to consider other means than such pieces of mechanism present, and to seek for what seems to have been, hitherto, wholly lost sight of, namely, a contrivance within the reach of every individual, and applicable in every circumstance. This desideratum, M. Mayor thinks, will be found in his CLINICAL FRAME, which he thus describes:

"The first things to be sought for are two narrow boards or poles about the length of the patient, and two cross-bars of the same nature, of about a yard only in length. With these four pieces of wood, which may be easily united at their extremities by means of nails, rivets, bits of cord or handkerchiefs, we shall be immediately in possession of a frame in all respects stout enough for the end in view. It now remains to fill up the intermediate space; and recourse must here be had to bands of webbing; but if these should not be at hand, or at all events, should they be difficult to obtain, a few stout cravats would conveniently supply their place. Whether, then, the webbing bands or the cravats be employed, they must be arranged crosswise, fastened securely at their extremities to the sides of the frame, and, above all things, possess sufficient strength to resist the weight of the patient when suspended in the air. Substitutes for the above materials may be equally found in towels, napkins, sheets, or indeed in anything that would serve to constitute a bottom, soft, but yet sufficiently strong. After such simple data, it would be superfluous to point out how ingenious mechanics might modify the contrivance so as to prepare a frame more elegant, more in harmony with their own talent, their desire of gaining reputation, or indeed with the fortune of those who employ them; on the contrary, it would be advisable to urge the necessity of preserving the same simplicity in the construction of this, which will be found in the means destined to effect its elevation; for there will be quite enough of those who are ever on the alert to throw a species of luxury about a machine, who will believe that they

*Fig.* 136.



have perfected this, when, from a simple and effective instrument they will have converted it into a complicated one, despoiled of its best qualities.

"To raise the frame, as well as the patient, who is supposed to be stretched upon its bottom, it would be sometimes sufficient to employ two or three dexterous persons, such as are met with in hospitals; but in addition to the difficulty of finding such assistants, there will be always more or less inconvenience attending this operation when effected by the hands, in consequence of the shocks to which the frame will be constantly subjected from the slightest deviation from a simultaneousness of action. It will, therefore, be found more convenient to have recourse to the means employed in the hyponarthecic suspension, and to apply to the whole body that which so well succeeds when applied to a limb.

"Thus, the four angles should be perforated with four holes, as in the Fig. 136, through which a strong cord will be run in order to form two kinds of parallel bows or arc-loops of suspension; the one longitudinal, the other transverse; the former corresponding to the sides, the latter to the extremities of the frame.

"Recourse may also be had to one loop only, which will give to the frame the kind of tilting (*jeu de bascule*) observed in the beam of a scale. Movements of this kind are occasionally of importance, as when it is desired to raise the upper part of the body much above the horizon, or even the lower part alone.

"One strong vertical cord, firmly attached, and passing through a pulley, will suffice for the elevation of the frame charged with the patient, and must be arranged in the same manner as for the hyponarthecia of the extremities. Thus, in the dwellings of the poor, the ceiling is usually provided with large beams; nothing, therefore, will be found more easy than to arrange properly the staples or pulleys.

Recourse may be equally had to a suspension bar of the kind represented in the figure and placed at the head of the bed. But when these resources fail, or cannot be employed without some disadvantage, let that be remembered which is done by certain mechanics, particularly masons, when they desire to lift a heavy weight. The *tripod*, called generally the triangle, is the most easily constructed, the most firm, and in all respects the most convenient that can be employed for the object here proposed. This tripod, seen in the figure, should have a pulley attached to the iron hook observed at its upper part or point of union, in order to receive the vertical cord destined to raise the frame; and thus provided, should be stretched across the bed.

"In order to render the ascent of the frame perfectly gradual and easy, the vertical cord should be made to pass round a cylinder fixed to two of the legs at their upper part, which may be turned either by a winch, or, if provided with holes and a small handle, as a capstan. Instead of this, if the free end of the vertical cord, after having passed through the pulley be firmly secured to one of the legs of the tripod, the above effect may be accomplished by means of a strong stick, which is employed to twist the cord, and which, by shortening it at each turn, elevates the frame.

"But a still easier method is to employ a simple lever of the first power, — a pole, for instance, — whose fulcrum should be beside the bed, and to one end of which should be fastened the arc-loops themselves, as seen in the figure, or, what is still better, the vertical loop, which will permit, during its elevation, the frame to be better balanced; in lowering, therefore, the other end of the lever, the ascent of the frame may be regulated with precision. The fulcrum, thus placed between the power and resistance, may be simply a rope's end made into a loop, and either firmly attached to the ceiling, or else to the tripod, which, in this case, instead of being stretched over the bed, should be placed beside it.

"With the ordinary hyponarthecic loops attached to the Clinical Frame, which will allow of the point being varied where they are taken up by the vertical loop, we obtain, with the greatest facility, the power of elevating this frame in any direction we may choose, whether completely horizontal or with an inclination towards either of its extremities or either of its borders: an advantage which will not be without its utility on particular occasions.

"It will be hardly necessary to observe that, in order to obtain these effects, it suffices merely to place the vertical cord at the centre of gravity itself of the frame, or more or less beyond this, in the direction either of the head or feet, and to make, for producing lateral inclination, the arc-loop shorter on one side than on the other. The arc-loops, however, ought to be collateral, for all these little advantages would be far less easily obtained were the cords, which perform the office of loops, placed transversely at either of the extremities of the frame.

"Like all frames destined for a clinical use that just described may rest continually in place, in order that it may be raised at the moment desired, without previous preparation; that is to say, the patient should repose upon the bottom of the frame itself; or else this elevation may be applied only at the instant when occasion may require it. In the first case, we should be careful that the bands or the pieces of cloth which constitute the bottom of the frame do not annoy the sufferer, and are preserved as clean as possible. This will not be difficult if preference be given to large pieces of stout cloth, which will occasion so much the less inconvenience, as they may be stretched at will, without forming any incommodious folds.

"It will be clearly seen, moreover, that with this disposition the surgeon may readily expose the ulceration, and manage the application of dressings, by displacing from the bottom of the frame that portion which otherwise masks the affected parts.

"When, on the other hand, it is found advisable to apply and elevate the frame several times, recourse should be had to the webbing bands, which, by means of a broad, thin, pliant piece of wood, may be glided, at the very moment, under the patient, much in the same manner as we should change the bandelettes in the apparatus of Scultetus. These bands, already attached to one side of the frame by one of their extremities, are then brought to the opposite side, where they are fastened, by means of their free extremities, through the intermedium of ribbands, buttons, or buckles. This simple and easy means of gliding the bands under the patient, without at all incommoding him, and thus interposing between the bed-clothes and himself some sort of bottom proper to sustain him when elevated, would naturally suggest a still more simple support, namely, cravats or oblongs, of whatever tissue they may be composed, or of whatever breadth it may be thought proper to afford them. The Clinical Frame may not only be regarded as a species of hyponarthecia, destined to sustain momentarily the entire body in any manner, or in any direction desired to be imparted, but, being moveable, it will be seen to offer one very precious resource in a circumstance of the most important nature. Illusion is here made to the frightful sloughing sores common to the lower and back part of the body, and which the pressure against the bandelettes renders insupportable, and tends constantly to exasperate. Many are the means, without doubt, employed to attenuate this horrible pressure; yet they not only most often fail, but are difficult to procure, to maintain in place, and preserve in a proper state of cleanliness. The Clinical Frame, then, with very little additional trouble, averts this inconvenience in the following manner:

"Let the individual be extended over the bands placed transversely behind his back, and let us suppose that these bands are properly stretched from one side of the frame to the other; it is clear that the poor sufferer will press upon them all with his entire weight. But if we detach those bands which correspond to the ulcerations, and if, at the same time, we remove sufficient of the hair, wool, or straw of the mattress which exists under the bands we have just placed aside, we shall immediately obtain a sort of hollow or depression, in which the ulcerated surface will be but very slightly touched. It will be even possible to afford such depth and extent to this depression that the affected parts remain, as it were, in the air, in a complete state of isolation. In short, the bands placed above and below the seat of ulceration will sustain the body with great exactness, and will leave the sore open, and at that degree of elevation which may be judged necessary to substract it more or less from the pernicious influence of the pressure we are striving to avoid.

"It may be, however, observed, that instead of the excavation already spoken of, the mattress may be cut across, and of one mattress two smaller ones formed, which may be placed so as to allow of a sufficient space between them to guarantee the wound from pressure, according to its extent.

"The Clinical Frame may, in campaign, admirably serve for a litter, or for the transport of the sick or wounded, as it possesses the advantage of the most simple form of construction, and of being made of materials to be found on all occasions. In this case, instead of webbing or other bands to form the bottom of the frame, recourse may be had to simple cords covered with hay, straw, leaves, grass, pieces of clothing, &c. When it is found necessary to have the litter stationary, nothing would be more easy than to adapt to it a tripod or triangle, which would possess two remarkable advantages; firstly, in forming solid feet for the support of such temporary bed; and, secondly, in forming a frame proper to receive a blanket, or something of the kind, to serve for the purpose of a curtain, and to protect the sufferer from the sun, rain, wind, &c.

"Many other occasions might, doubtless, be found for the use of this frame when put into suspension. Serving as a sort of hammock, it would seem to invite officers to establish it under their tents, and would guarantee them from the humidity of the ground, from insects, and other annoyances inseparable from a bed placed directly upon the earth. The same may be said of it in a bivouac, where the triangle need only be covered by a cloak.

"The suspension-bar, as seen in Fig. 136, adapted to a common hospital-bed, has been already pointed out as a means of establishing the suspension of a hyponarthecic apparatus: it requires no description, for the drawing will suffice to give the most correct idea of its construction. It will be seen therein to represent, however, only one-half of it, as the drawing of the other half would have interfered with the view of the tripod."

# PART THIRD.

## CHAPTER I.

## OF THE APPARATUS FOR THE TREATMENT OF FRACTURES.

### GENERAL CONSIDERATIONS.

The responsibility involved in the proper treatment of this numerous class of injuries, renders them one of the most important parts of the practitioner's duty, because not to be able to set a broken limb, or reduce a dislocated bone, is enough to destroy all professional reputation; the public in general not being able, or willing, to understand the distinction drawn between the duties of the surgeon and those of the physician. Indeed, when a case turns out badly even in the hands of a most able surgeon, the friends of the patient, to use the language of Mr. Amesbury, "sometimes think they can never injure his reputation sufficiently; and though in many instances he is not at all deserving of blame, they usually load him with epithets of ignorance, neglect, and presumption. If we examine a little into this feeling we shall find that it is nothing more than what is naturally to be expected. Patients, as a general rule, know nothing scientifically of the nature of fractures, or of the means required for their cure; consequently they judge of a surgeon's ability only by the result of his case. If it terminates well, he has only done his duty; but if the limb be deformed, the patient will immediately say that the fracture was badly set, and be confirmed in this opinion not only by the observation of his friends, who seldom fail to find out cases to substantiate their belief," but also by every empiric who may be interested in the professional destruction of his attendant. Yet important as these injuries undoubtedly are, it would be foreign to a work of this kind to treat them in all their bearings, or consider the causes, physiological and pathological changes, &c., which a less condensed treatise might properly demand.

I shall, therefore, in the consideration of this part of the subject, confine myself mainly to such points as are most connected with the treatment; only hinting briefly at such general considerations (especially as respects the causes of the deformity, and the indication to be fulfilled in the treatment), as are concerned in the plans of practice; referring those who wish a more minute knowledge of them, to the many articles to be found in all works on Surgery.

*Fig.* 137.

The Bones being intended for the support of various portions of the body, and acted on by the muscles, it follows that any solution of continuity in their structure, must involve very materially the use of the part, and create deformity from irregular muscular action. The overcoming of this deformity, and the retention of the broken ends in such a position as will be most favourable to their union, are then the first principles involved in the treatment of fractures. To prove this, a slight reference must be made to the bond of union or Callus. The first effect of fracture being a division of the fibres of the bone, with more or less laceration of the soft parts, inflammation necessarily follows. This results in fortunate cases, in the effusion and organization of lymph; this subsequently becomes bone, and by its extension beyond the fractured extremities binds them together externally (Fig. 137), until it is also effused within their extremities. This external matter, or Provisional Callus, being that which is first formed, is of course most directly implicated in the results of the means employed, the second, or definitive callus, not being completed till long after the ordinary duration of the treatment. Certain circumstances, as rest, position, and the prevention of too high a degree of inflammation, or the excitement of the necessary action where it does not naturally exist, are, therefore, essential to the cure, and the creation of these circumstances, or the fulfilment of these conditions, constitute the general principles of the treatment. But as the proper fulfilment and comprehension of these points can only be gained from an accurate knowledge of physiology, I can do little else, at present, than specify the general objects to be attained by pursuing them.

To accomplish the indications generally required for the cure of a fracture we must, therefore, 1st. Reduce the displaced ends of the bone; 2d. Coaptate and keep them reduced; and 3d. Subdue the local inflammation, and combat the accidents that may arise from the means of treatment.

1st. *Reduction.*—The first indication, or the reduction of the displaced ends of the bone, is limited to such fractures as are accompanied by this deformity; such as those of long bones surrounded by powerful muscles, or exposed to blows, which can act directly on either fragment.

To accomplish the reduction resort is had to what is technically known as Extension, and Counter-Extension, or the use of such means as tend to bring the bone to its original length. Extension is the force applied to that extremity of a broken bone which is furthest from the heart; and Counter-Extension that which exactly balances the extension, or prevents the whole body yielding to the force applied to the lower end of the limb. But in some instances, even in fractures of the extremities, as in fractured patella, olecranon, &c., it is improper, if not impossible, thus to make extension and counter-extension, and we are obliged to resort to position, or placing the muscles in a state of relaxation, in order to accomplish our object. This latter point, position, has for many years been a disputed question among surgeons; Pott, and many of the English school, contending for its advantages, whilst the French and American writers advocate the more mechanical means of treatment, averring that position alone would prove injurious to most cases. As in most disputes, opinions have been urged to the injury of all parties. That in many cases extension is absolutely necessary to the reduction of a fracture cannot be doubted, but that position is also not to be neglected is equally indisputable. Take, for example, a fractured clavicle, the mere extension effected by carrying the shoulder outwards would not relieve the deformity without attention being also paid to the position of the shoulder, viz., backwards and upwards. Again, a fracture of the femur, or of the leg, would not be properly reduced by mere extension and counter-extension, unless at the same time the position of the foot was attended to. The prudent practitioner will therefore bear in mind simply the fact, that it is the force of muscular contraction that is to be overcome; and whether accomplished in an extended or flexed position, by compression of bandages, or without them, not rest satisfied until he has accomplished this object. In fractures of the long bones the weight of French and American authority is in favour of the extended position of the limb; whilst the pupils of Pott, and many of the English surgeons, still prefer the flexed, especially in the treatment of fractures of the lower extremities.

2d. *Coaptation, and keeping the bones reduced.*—The accomplishment of these indications is usually the result of the employment of a certain force more or less directly to the seat of fracture. Where two bones are parallel and it is important to keep them at a certain distance, as in the bones of the forearm and leg, or where one fragment is liable to such irregularity of position as cannot be otherwise overcome, it becomes necessary for the surgeon to press upon them with his fingers, and mould them to the desired condition; thus coaptating or setting the fracture. But where the deformity can be remedied by the action of muscles it is better not to finger the seat of fracture, as the pressure of the soft parts on the sharp points of bone might create such irritation as would rather increase than relieve the existing symptoms.

As the muscles are, also, the motive powers of the body, and as they are attached to the bone, it follows, that even after the setting of a bone, any sudden action on their part must tend to displace the fracture; so that the common idea of a bone once set being always afterwards in its proper position, is incorrect, the facts being most frequently the reverse, and the attention of the surgeon to the state of the bone being always required at each dressing, until consolidation has taken place, lest the action of the muscles again displace it. In order to guard against such changes various means are employed, as Splints, Cushions, or Junk-bags, Pads, Extending and Counter-

Extending Bands, Pallettes, or Hands Splints, Soles or Foot Splints, Compresses, Pads, Slings, and Rollers,—the minute directions for the preparation and application of each of which will be given in connection with the treatment of the particular fractures for which they are required.

3d. *Combatting inflammation, and the accidents resulting from the means of treatment.*—These, though placed last, are by no means the least important items in the treatment, fractures being so generally the result of violence that inflammation is very apt to ensue. This, provided it does not run too high, or involve neighbouring parts, need not be interfered with, a certain amount being necessary, as stated, to the formation of callus. But should the inflammatory action become excessive, the use of cold washes, and the antiphlogistic system generally, will be necessary to prevent its going too far. As a general rule, such a degree of inflammation should exist about a fractured bone as will result in the effusion of lymph. Beyond this, the effect is injurious to a rapid cure.

The combatting of the accidents resulting from the plan of treatment will more frequently test the surgeon's skill than any other portion of the case. Excoriations, ulcerations, bed-sores, and constitutional symptoms, such as fever, diarrhœa, &c., are all liable to complicate a case; and there are few of any experience who have not felt the evils to which I now refer. Every attention must, therefore, be given to the proper construction of the bed and of the apparatus; to the room in which the patient is to be confined; to diet, &c., &c., in order to guard against accidents, which sometimes will produce a result that nothing but previous experience could have led any one to anticipate. In the plan of Pott, or the flexed position of the lower extremity, there may be sloughing and bed-sores; in the extended state of the limb, ulceration on both heel and perineum; whilst paralysis, arrest of circulation, and excoriation, may follow the treatment of similar injuries in the upper limbs. As, however, these evils can only be hinted at here, or better refered to in each accident, I shall, without further delay, pass to the treatment of particular fractures.

# CHAPTER II.

## OF FRACTURES OF THE BONES OF THE HEAD AND TRUNK.

### FRACTURES OF THE SKULL.

The treatment of fractures of the skull being dependent on whether or not it is necessary to trephine, their particular consideration would here be out of place. I merely, therefore, state, that in any case where it is necessary to retain dressings to the cranium, reference should be made to the *Recurrent Bandage of the Head;* the *Single or Double T;* the *Handkerchiefs of Mayor;* the *Bandage of Galen*, or to the *Sling of Four Tails*, as before given.

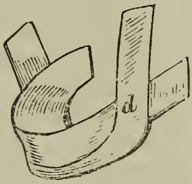
### FRACTURE OF THE BONES OF THE NOSE.

It not unfrequently happens that in consequence of the violence necessary to produce this fracture, the bones are driven in upon the nasal cavity, or depressed, so as to destroy their natural arched form. To remedy this, a probe or director should be introduced within the nostril, and the depressed bone raised to its proper level. Then, any dressings to the part, or to the internal angle of the eyes, that may be necessary to subdue the inflammation and prevent injury to the nasal duct, should be retained in position by the Double T bandage of the nose, Fig. 71, page 114. No means are required to keep the bones reduced after the fracture is set, as they are not liable to displacement from muscular action.

### IN FRACTURES OF THE LOWER JAW,

Anterior to its angle, we may employ *Dr. Barton's Bandage*, p. 86, with the use of a pasteboard splint, made as in the figure, like the body of a sling; or we may use the *Sling of the Chin*, as before mentioned, or the *Bandage of Professor Gibson*, which is composed as follows:—

*Fig.* 138.

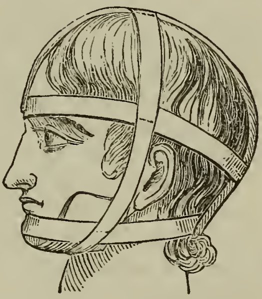


### GIBSON'S BANDAGE FOR FRACTURE OF THE JAW

Consists of a roller five yards long and two inches wide, and of a compress and splint, when necessary.

In its application, after having carefully examined the injured parts, and replaced any of the teeth that may have been deranged, run the fingers along the margin of the jaw, in order to mould it into its proper shape. Then closing the mouth firmly, make the lower teeth press fairly upon the upper, and place a compress of moderate thickness under the fractured portion, where it should be held by an assistant. Next take the single-headed roller, and commencing on the top of the head, pass it by several turns down the side of the face, under the jaw, and over the compress; after the third turn of this kind make a reverse on one temple, so as to run off perpendicularly and surround the forehead and occiput by circulars of the vault of the cranium.

*Fig.* 139.



On the third of these turns, pass from the occiput, obliquely over the back of the neck, and under the ear, to make three circulars of the chin and neck; from the neck pass obliquely upwards, to go circularly round the forehead, and place pins at each turn. If the turns are likely to slip, fasten a small strip on the forehead, and carry it over the vertex to fasten it to the turns on the neck, and thus secure them more perfectly, as seen in Fig. 139.

During the treatment of fracture of the jaw the patient must be fed on soft, semi-liquid food, and not allowed to speak; but there is no occasion for inserting a piece of cork between the teeth, or extracting any of them, as there is usually enough space between them as they stand, to enable any one to suck food into the mouth. This fracture, under favourable circumstances, consolidates in four or six weeks, but the patient should not be allowed to eat hard or tough articles for some weeks afterwards.

## FRACTURES OF THE VERTEBRÆ

Require no apparatus. Attention must here be mainly directed to the use of the catheter and of enemata; directions for which will be given hereafter. An important point to be recollected in these injuries is, not to turn the patient on his belly in order to examine the back, but to turn him only on to his side; for as the abdominal and intercostal muscles may be paralysed by the injury, the diaphragm alone can act in respiration. But in order that the diaphragm may descend, the abdomen must bulge out sufficiently to permit the descent of the bowels and expansion of the chest. If, then, the patient is kept for a length of time on his belly, there is not sufficient force in the diaphragm to do this, as it has to overcome the resistance made by the weight of the body on the bed, consequently, if the examination should be tedious, the patient will run the risk of being suffocated.

### IN FRACTURES OF THE STERNUM

The indications are, to prevent deformity from the projection, or depression of the fragments; to keep the chest at rest, and oblige the patient to breathe by the diaphragm and abdominal muscles. These may be well fulfilled by placing a compress over the part, and constricting the chest by the *Crossed Bandage*, or by the *Spiral of the Chest*, as before shown, so as to prevent displacement in the respiratory movement.

### FRACTURES OF THE RIBS

Are to be treated on the same principles as those of the sternum, the compresses being over the seat of fracture, if the fragments project externally; but over the end of the ribs, if they point inwardly. These compresses and the whole chest are to be confined by the *Spiral Bandage of the Chest* (Fig. 41), which should be drawn very tight.

### FRACTURES OF THE PELVIS

Require no other apparatus than a broad bandage of the abdomen and pelvis; there being here little or no tendency to deformity, owing to the attachment of the muscles.

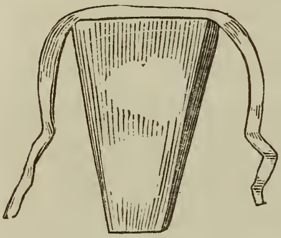
### FRACTURES OF THE CLAVICLE

Are treated by several kinds of apparatus, all having for their object three indications, viz., the keeping of the shoulder *upwards*, *outwards*, and *backwards*. The objects to be attained by these movements are as follows:—1st, the shoulder should be elevated in order to bring the fragments to the same level; 2d, carried outwards to preserve the proper length of the clavicle, keep the arm at its proper distance from the sternum, and preserve the pectoral space; 3d, backwards, to bring the bones into the proper line in front. The first means of fulfilling these important indications are those recommended by the surgeon who specially enforced them, and are known as the

### APPARATUS OF DESSAULT.

This is composed of three single-headed rollers eight yards long and two and a half inches wide; of a pad the length of the humerus, four inches thick at its base, made in the shape of a wedge by folding muslin on itself, so as to form a compress graduated from one end (as before shown), and then covered with a piece of muslin; of a compress to go over the broken bone; of a short sling to support the forearm; and of a piece of muslin sufficiently long and wide to surround the chest, arm, and bandage, and keep the whole dressing in its place.

*Fig.* 140.



These being prepared, the patient should be seated either on a bench, or chair without a back, or else standing, an assistant elevating the arm of the injured side, and carrying it off at right angles to the body. The surgeon now places the pad in the axilla, the thick end upwards, where it is to be held by the assistant. The initial end of the first roller is then placed on the middle of the pad, and two or three circular turns of the chest made, in order to fix it, after which the roller should be carried up over the front of the thorax; over the sound shoulder; under this arm-pit to make a semi-circular turn on the front of the chest; over the pad; round on the back; over the sound shoulder; under the arm-pit, and then spirally around the chest (Fig. 141).

Then flex the forearm on the arm, and bring the latter down along the pad, pressing its lower extremity forcibly against the side of the chest. This, by forcing the shoulder outwards, draws the clavicle to its original length; for the humerus being thus made a lever of the first kind, its upper end is drawn from the shoulder in proportion as the lower end is forced against the thorax. At the same time direct the head of the humerus upwards and backwards, which immediately reduces the fracture, and the assistant should hold it so until the next two bandages are applied. These are intended to keep the fracture reduced. With this view, place the commencement of the second roller in the axilla of the sound side; carry it across the breast; over the upper part *of the arm* of the injured side, and obliquely round the back, to the axilla, whence it started, and continue these turns down the arm to the upper part of the forearm; drawing them gently at first, and gradually tightening them as they approach the elbow, so as to force it well into the side of the body (Fig. 142).

*Fig.* 141.

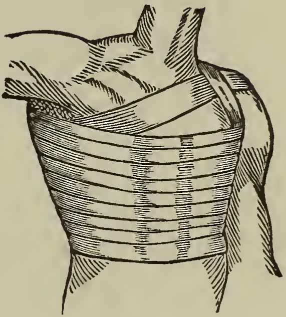
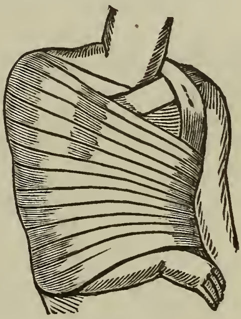
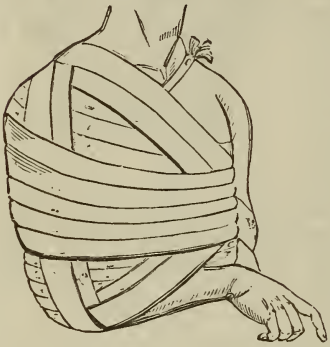


*Fig.* 142.



The object of this roller is to carry the shoulder and head of the humerus outwards by pressing the elbow inwards. In order now to keep the shoulder upwards and backwards, the third roller should commence in the sound axilla, pass obliquely over the front of the chest to the fracture, where there should be a compress; over this, and down the back of the arm to the elbow; thence obliquely upwards to the front of the sound axilla; under this, obliquely upwards over the back, over the fracture, down the front of the arm to the elbow, and thence obliquely to the back; then to the sound axilla; under this to its front part, and over the chest and fractured bone, to run the same course, and end by circulars of the chest, so as to fix the whole. The first turns form two triangles (Fig. 143), one of which is before the breast, the other on the back, and are the only difficult turns to recollect. But when it is remembered that starting from the sound axilla, the bandage is to go over the fracture, down the arm to the elbow, *and from the elbow always to the axilla*, there will be found no difficulty in its application.

*Fig.* 143.



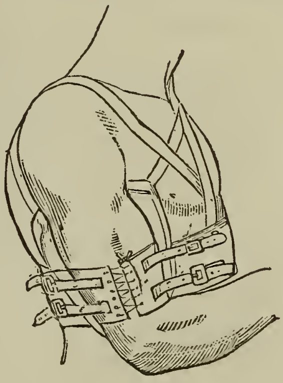
It now remains to support the *forearm* by a sling, and cover the whole apparatus by the piece of muslin before spoken of, in order to prevent the turns of the roller from slipping.

The principles upon which this bandage acts, viz., by converting the humerus into a lever of the first kind, carrying its lower extremity forwards, inwards, and upwards, and thus pushing the shoulder backwards, outwards, and upwards, renders it exceedingly well adapted to these fractures. The pad placed in the axilla serves as the fulcrum, the arm acts as the lever, and the clavicle as the body to be moved. One of the great advantages claimed for this apparatus is, that it may be readily constructed. It is liable, however, to some objections; thus, for instance, the compression which it exerts about the chest renders it ill adapted to females or patients of a delicate constitution; it is also very heating in warm weather; requires to be taken off and re-applied very frequently in consequence of its becoming easily displaced by the movements of the patient, especially if restless; whilst the pressure on the axillary nerves and bloodvessels, from the too great tightness of the second roller or the use of a pad which is rather full, often causes considerable pain and inconvenience.

### BOYER'S BANDAGE FOR THE SAME

Is composed of a wedge-shaped pad for the axilla; a quilted belt of webbing or of linen, about five inches wide to surround the trunk, and fasten by means of straps and buckles; and a circular band for the arm, of the same materials as the belt, made to lace in front. Four straps are attached, two on each side, near the uniting edges, and four buckles to correspond with these are fastened upon the belt, two before and two behind the arm. Then the pad being placed in the axilla and its bands car-

*Fig.* 144.



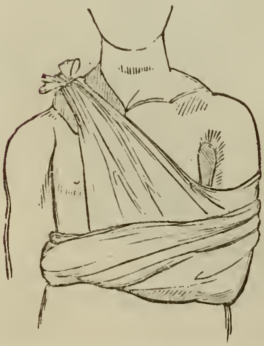
ried one before and the other behind the chest to the opposite shoulder, are tied and the belt is then passed round the body, beneath the pad, and a little above the bend of the elbow, in order to buckle posteriorly. Next, the circular band is laced upon the arm, and brought in to the trunk by means of the straps and buckles. While the elbow is thus fixed firmly to the side, the pad tends by its resistance to push the superior part of the arm outwards, and the elbow may be moved either forwards or backwards by merely tightening the anterior or posterior straps, so as to carry the shoulder in the opposite directions.

This bandage, acting upon the same principles as that of Dessault, is preferable to the latter only from the circumstances of its not being liable to become displaced, and from its causing a more limited compression of the chest; the compression being capable of being regulated by means of the straps and buckles which unite the ends of the belt, better than by the turns of the roller.

### MAYOR'S HANDKERCHIEF BANDAGE FOR THE SAME

Requires two large handkerchiefs, one folded in triangle, the other in a broad cravat; a cushion for the axilla; and a soft pad for the opposite shoulder. After preparing these, let the cushion be placed in the axilla, and the arm brought against it with the forearm bent. The doubled edge of the handkerchief, folded triangularly, is then to be made to envelop the elbow by folding its summit around, while the angles support the hand; the posterior angle being carried up under the axilla and

*Fig.* 145.



behind the back to the opposite shoulder, upon which a compress should be previously placed, after which the anterior angle should be brought up in front to meet the former and tie.

The second handkerchief, in cravat, is to confine the elbow and forearm more securely to the body, by being carried round the waist, and fastened upon the opposite side of the trunk.

Mayor modifies this bandage in the following manner when intended for fracture of the acromion: After the first handkerchief or sling is applied some compresses should be placed upon the injured shoulder, and a few vertical turns of a roller passed round the shoulder and elbow, as in the third roller of Dessault; after which, the second handkerchief is to be applied as above; the cushion under the axilla should also be omitted, and a compress substituted, before applying the first handkerchief, between the elbow and side.

This mode of treating fracture of the clavicle answers very well as a provisional dressing, and better than the ordinary sling; but where the other means can be obtained a more perfect cure will certainly be accomplished by them.

### FOX'S APPARATUS.

In 1828, Dr. George Fox, of Philadelphia, then Resident Surgeon of the Pennsylvania Hospital, at the suggestion of his friend Dr. James A. Washington, introduced into the practice of that institution an apparatus, for the treatment of fracture of the clavicle, that has since gained a large share of professional confidence. Being slightly modified in accordance with the experience of the hospital, it, as at present used, consists of a stuffed collar; a pad about five inches long, four wide, and two or three inches thick at the base; and of an elbow piece or sling, as shown in Fig. 146.

Fig. 146.

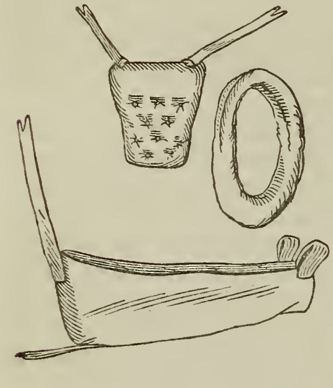
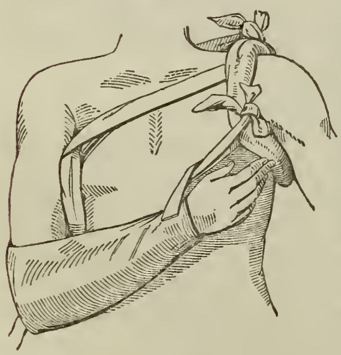


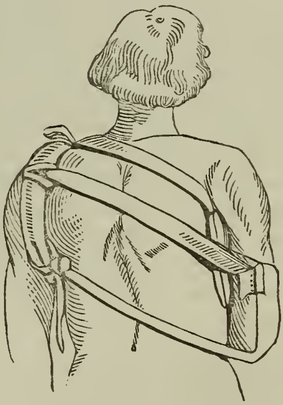
Fig. 147.



The Collar is made of a piece of muslin four inches wide and long enough to go around the shoulder, sewed together on its sides, stuffed with cotton, and then joined at its ends. The Pad is wedge-shaped, and like Dessault's, except in its size, being neither so thick nor so long, as it is merely intended to fill up the space between the upper part of the arm and the side of the body, and yet leave a space between the elbow and the ribs. Two tapes are to be attached to the thick end of the pad, in order to fasten it to the collar. The Elbow-piece, or Sling, is made of strong muslin or brown holland, like half of the sleeve of a coat, so that it may embrace the elbow, mount half way up the arm, and descend nearly to the wrist. To its upper and posterior ends are attached two pieces of broad tape, long enough to reach across the back to the collar; and on its lower portion are two loops to receive a tape for the front fastening. In applying the apparatus place the collar on the sound shoulder; the pad in the injured axilla; fix it there by carrying its tapes, one in front the other behind the chest, and tie them on the collar. Flex the forearm; place the elbow-piece on it and the arm; bring the arm against the pad by carrying the forearm across the chest, and tie the loops which are on the sling near the wrist to the front of the collar, as in Fig. 147, when the fracture will generally be found to be perfectly reduced.

Should there, however, be any occasion to carry the shoulder more outwards, it may be accomplished by drawing the wrist nearer to the collar; whilst if it is necessary to carry the shoulder more upwards, or backwards, draw upon the tapes which are attached to the upper and posterior part of the sling. Next fasten the tape which is attached to the upper and posterior end of the sling to the collar behind, carrying it across the back, so as to thrust the shoulder upwards, and tieing that attached to the elbow also to the collar behind the back. The elbow will thus be forced into the side, and the shoulder thrust outwards and backwards to any extent that may be desired. Fig. 148 gives a view of the arrangement of the bands upon the back. The upper strap is attached to the pad; the second one to the superior posterior portion of the sling, and the third to its posterior inferior extremity, or the point of the elbow.

*Fig.* 148.



*Observations.*—Of all the means recommended for the treatment of fracture of the clavicle few are more simple, or fulfil better the indications, than this apparatus of Dr. Fox. Made in a few minutes of materials nearly always at hand, reducing the fracture, yet leaving it open to inspection, light and easy of application, producing no constriction of the chest, pressure on the mammæ, or on the axillary vessels or nerves, it offers advantages that other means do not generally possess, and its introduction into practice has caused the *perfect cure* of many cases, and saved patients much unnecessary suffering and inconvenience. In the Pennsylvania Hospital it is the only means employed for the treatment of this injury, and the repeated testimony of the numerous cases treated in this large hospital, where such fractures are extremely numerous, has proved its ability to produce perfect cures. Indeed, so perfect are the cures, even in very oblique fractures of this bone, that it is a rare thing for a simple case of this fracture to go out of the house with any deformity, save that which time cures, viz., the deposition of the provisional callus. From 1829 up to the year 1838, a period of nine years, seventy-five cases of fractured clavicle were treated in the house; of which sixty-three were discharged cured, and twelve left the house while under treatment, the apparatus allowing of their walking about as usual.[1] In the subsequent years, a large number of cases have been treated by other surgeons with such success that few who have employed it ever resort to any other means of treatment, except in special cases, where an additional bandage, as a posterior 8, &c., may be added. But generally, when there is any derangement of the fracture, it is only necessary to tighten the anterior or posterior tapes of the sling, as above directed, in order to remedy it. The effect produced on a clavicle by this apparatus is well shown by the testimony of Dr. Norris, one of the surgeons of the hospital, who, in his notes to Liston's Surgery says, "he was enabled to treat with entire success a forward dislocation of the sternal end of the clavicle, after Dessault's bandage had been several times well applied, but without success." The difficulty of retaining the bone in its position, in this injury, being so much more difficult than in cases of fracture, speaks highly in favour of the power of this simple bandage.

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[1] Wallace's Statistics of Fracture: Med. Examiner for 1838.

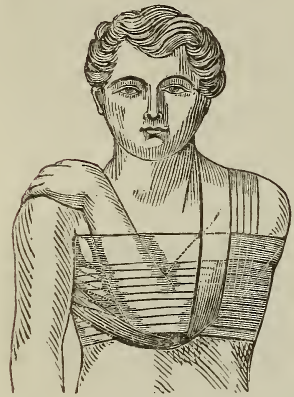
### FRACTURES OF THE SCAPULA

Are generally accompanied by so much inflammation from the contusion, as to render its removal an object of greater importance than the treatment of the fracture itself. Warm fomentations by means of bags of chamomile flowers, or flannels wrung out of hot water, leeches, &c., must, therefore, first be em-employed; after which we may employ the pad, and first and second roller of Dessault, Fox's Apparatus, or the bandage of Velpeau. The latter, which is hereafter shown, is recommended by its distinguished author as especially applicable to acromio-clavicular luxations; to fractures of the acromion or other points of the scapula; to fractures of the neck of the humerus as well as to fractures of the clavicle. But from numerous opportunities that I have had of witnessing the result of its application to the latter injury, in his own wards, I think it is not so perfect in its cures as the means just referred to. To the other cases it is well adapted, and is applied as follows:

### VELPEAU'S BANDAGE.

Make the patient embrace the sound shoulder with the hand of the injured side, placing a compress or piece of muslin between the side of the chest and the injured arm, in order to prevent excoriation of the two surfaces, from contact and perspiration. Then place the initial extremity of a roller ten yards long and two and a-half inches wide, under, or behind the axilla of the sound side; conduct it over the back; over the injured clavicle; down on the front and *outside* of the arm; under the *outside* of the elbow; up and over the chest to the sound axilla. Make two similar turns, and on again reaching the axilla pass circularly around the chest to the same axilla; then make a turn over the clavicle and arm; then a circular, and so on until the bandage reaches the upper part of the forearm, as seen in Fig. 149. By means of this bandage, especially when wet with starch or dextrine, the arm can be supported in a firm cap, which will last for weeks without changing; but where these articles are not used, several pins must be placed at the different turns in order to secure them. It will require but a single application of this bandage to prove its power in the accident referred to; and as dislocations of the humeral extremity of the clavicle are generally admitted to be retained with difficulty in their proper position, this bandage will be found to be a very valuable addition to the other means of treatment.

*Fig.* 149.



# CHAPTER III.

## OF FRACTURES OF THE UPPER EXTREMITY.

### FRACTURE OF THE NECK OF THE HUMERUS

Is generally treated by *Boyer's Bandage*, which is composed of two rollers two and a-half inches wide; of three strong pasteboard splints between two and three inches broad, and the length of the arm; of a pad four inches thick at one end, terminating at the other in a narrow point, and long enough to reach from the axilla to the elbow, and thus serve as an inside splint, and fulcrum for the reduction of the fracture; the thick end being placed in the axilla, if the lower fragment is drawn inwards, but the reverse, if the upper one is thus drawn; lastly, a strip is necessary to support the forearm.

Then, the fracture being reduced, and maintained by assistants, the surgeon fixes the initial extremity of one of the rollers at the upper part of the wrist by two or three circulars, and applies it to the limb, as in the Spiral of the Upper Extremity, until he arrives at the seat of fracture, where several turns must be made around the part so as to bind it firmly, and overcome the action of the muscles most likely to cause displacement. From hence the surgeon carries the head of the roller twice round the opposite axilla, and confides it to one of the assistants, who retains it upon the top of the shoulder of the injured side. The first splint being then placed in front, reaches from the bend of the arm, as high as the acromion; the second, on the outside, from the external condyle to the same height; and the third, from the olecranon behind, to the margin of the axilla.

These being given to another assistant to hold, take the same roller, or a new one, and fasten the splints to the arm, by moderately-tight spiral turns, and while the assistants still keep up the extension, place the cushion between the arm and trunk, taking care to put that end upwards which the deformity calls for. Lastly, bring the arm against the trunk, and confine it there by means of the second roller, or turns of the same one applied horizontally around the body. Each turn of this roller should tighten from above downwards, if the lower fragment be displaced inwards; but if it is drawn outwards, the turns should be slack below and tight above, in order to act on the extremities of the lever formed by the humerus. The forearm is then to be sustained by a sling, which should not go under the elbow, lest it cause shortening of the arm, but should merely support the hand.

### FRACTURE OF THE BODY OF THE HUMERUS

Is also most frequently treated by Boyer's Apparatus. This consists of a single-headed roller eight or nine yards long and two and a-half inches wide; four splints, not quite so long as the arm, nor so broad as to touch each other when applied; and some charpie or cotton to pad them.

The surgeon then commences by applying a spiral bandage of the limb, fixing its initial end by a few circular turns above the wrist, and proceeding as in the spiral bandage of the upper extremity before referred to. Continuing the turns of the roller from the elbow to the upper part of the limb, he should apply the bandage firmly over the seat of the fracture, filling up the depression about the insertion of the deltoid muscle, in order to render the pressure uniform. Next placing the splints, well padded, along the arm, on its inside, front, back, and outside, and resuming the roller, let him cover in the splints by spiral turns of the bandage, and fasten it by pins until the whole is rendered firm; when the forearm should be fastened across the chest.

If in both of these fractures this last point is overlooked, and the arm and forearm be not well secured to the body, such motion will be produced at the elbow-joint as will derange the lower fragment, while the slipping of the turns of the spiral bandage on the forearm will necessitate its almost daily re-application.

### THE PLAN OF THE PENNSYLVANIA HOSPITAL

Obviates this, and is as follows:—After applying a roller from the fingers to the shoulder, place a padded, angular splint, similar to that recommended hereafter for fracture of the condyle, on the inside or front of the arm, and let it extend from the axilla or shoulder to the ends of the fingers. Place, also, three splints of the length of the humerus, on the remaining three sides of the arm, and bind them all to the limb by the ordinary spiral bandage, commencing at the wrist and extending to the shoulder. This plan ensures the most perfect rest of the elbow-joint and consequently of the fractured fragments; but to guard against the stiffness likely to result from a permanent rest of the joint, the angle of the splint should be varied at least every week. It must, however, be recollected that this, like the dressing of Boyer, is only applicable to fractures of the shaft of the humerus, that is, of the portion below the insertion of the pectoralis major muscle.

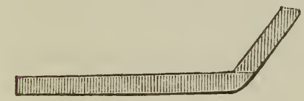
### FRACTURE OF THE CONDYLE—(PHYSICK'S METHOD).

The position of the condyles to the elbow-joint renders the treatment of this fracture a matter of great importance; as, without proper attention, the inflamation may extend to the joint, produce anchylosis, and deprive the patient of the use of the limb.

When the fracture is simple, a good method of treating it will be found in that proposed by the late Dr. Physick, which is as follows:

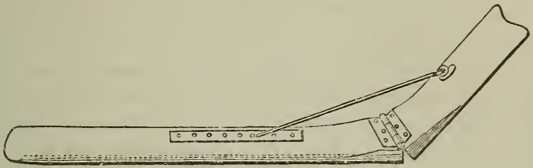
Flex the forearm on the arm so as to relax the flexor and extensor muscles, and apply a bandage from the fingers up to the shoulder by spiral reversed turns, making a figure of 8 around the elbow. Then prepare two angular splints like Fig. 150, of the same angle as that which the forearm takes when flexed, and covering them well with cotton on the side which is to be placed next to the limb, apply one on the inside, and the other on the outside of the arm, from the shoulder down to the fingers, confining them by another spiral bandage exactly like that of the Spiral of the Upper Extremity. The forearm being now brought across the chest, should be placed in a sling, with the palm of the hand next to the front of the chest, and the thumb pointing upwards; when the patient may walk about as usual, if free from pain. In using this splint great attention must be paid to the state of the internal condyle, which, unless the splint is well padded, is very apt to cause ulceration of the skin from pressure on its point. The angle, also, of the splint should be changed, as before directed, after the first ten days, in order to prevent anything like anchylosis.

*Fig.* 150.



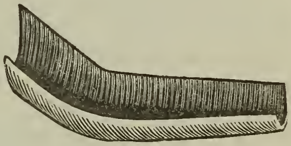
Whenever the splint just described produces excoriation, or when the wants of the surgeon may render a single splint more desirable than a set of those of varying angles, the one figured in the accompanying cut will prove of great utility. It is to be applied to the *front* of the arm, and its angle varied as occasion may require, simply by shifting the wire which is fastened to the arm portion in the holes on the part found on the front of the forearm.

*Fig.* 151.



When fracture of the condyles is complicated with contusion of the joint, or when it is compound, a better plan of treatment will be found in the use of a carved angular splint like Fig. 152, in which the arm may lie, loosely confined by a few strips of Scultet's bandage; while leeches, cold washes, &c., may be applied to the part, in order to combat the inflammation. Or it may be simply flexed and laid on a pillow, till the swelling is reduced; and then be treated as a simple fracture.

*Fig.* 152.



In order to make this carved splint, or in order to make a carved splint for any of the limbs, pursue the following plan: Lay the limb on or against a piece of stiff paper, or soft wood, and mark its outline with a pencil, tracing acurately its angles, prominences, &c., by running the pencil over its surface. Then seeing that the wood is thick enough to allow of its being hollowed out, so as to embrace at least one-half of the circumference of the limb, scoop out the wood in the lines of the pencil, shave off the outside with a spoke-shaver or gouge, so as to render it thinner and lighter; after which a piece of linen or muslin should be pasted over the outside to prevent its splitting from moisture, the inside being covered in the same way with soft buckskin to prevent the chafing of the skin on the wood.

These splints will be found of great utility in the treatment of injuries in the neighborhood of joints, and so simple that any one of the least mechanical ingenuity can make one that will answer the purpose very well, though the aid of a professed carver is desirable when a very light and perfect splint is required. Binder's board, tin, &c., are frequently used for the same purpose, but do not form as neat a dressing, and are also liable to be bent out of shape.

Several additions have lately been made to the list of articles especially suited to the purpose of splints for the preservation of rest in or about joints, such as felt, coated with gum shellac, brown paper plastered with starch or glue, &c. But though all may be occasionally useful, few, in my opinion, can be more readily or neatly adapted to the part than the Gutta Percha. When a strip of this, about one-eighth or one-quarter of an inch thick, is soaked for a few minutes in boiling water, it becomes almost as flexible as cloth; and being in this state applied to the body, adapts itself acurately to its shape, where in a few minutes it will become quite as stiff as thin board.

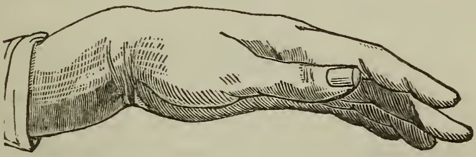
## FRACTURES OF THE FOREARM.

Fracture of one or both bones of the forearm are usually dressed exactly in the same manner, with the exception of fractures of the lower end of the radius, or of the olecranon. In treating a fracture of both bones, reduce the fracture by means of extension at the wrist, and counter-extension at the elbow; knead the muscles into the interosseous space in order to preserve it. Then, according to the plan of the Pennsylvania Hospital, take two straight splints, long enough to extend from the bend of the elbow to the extremity of the fingers, half an inch wider than the forearm, and well padded with cotton, the latter being confined to the splints by a roller, and thickest in the middle, so as to act as a pyramidal compress on the interosseous space. Then apply one of these padded splints on the front, the other on the back of the forearm, whilst it is in a state between supination and pronation, or, in other words, while the bones are perfectly parallel, and confine them there by a roller which should be only moderately tight at first, so as to guard against swelling. Then after the lapse of a week, draw the roller more firmly, so as to cause the padding of the splints to act on the interosseous space, but be careful that it is not too tight, and continue this dressing till the case is cured. The case of amputation of the arm, consequent upon the mal-application of the roller in a simple fracture of the radius, as before mentioned, should caution us against the use of too much traction in the application of the bandage, especially immediately after the occurrence of the injury.

### FRACTURE OF THE LOWER END OF THE RADIUS, OR BARTON'S FRACTURE.

This fracture often similates a sub-dislocation of the wrist, owing to the falling of the hand, as seen in the cut, and so frequent is it, that eight out of ten

*Fig.* 153.



of the supposed sub-dislocations of the wrist will probably be found to be fractures of this kind. For the best treatment of it we are indebted to Dr. J. Rhea Barton. His apparatus consists of two compresses, about three inches by two, or else two and a-half inches square, graduated from one end, and two splints prepared as in fracture of both bones of the forearm; together with a two and a-half inch roller. Then place one of the compresses on the front of the wrist, with its thick end downwards, about one-eighth of an inch above the articulating end of the radius; place the other on the back of the wrist, with its thick end upwards, so that it may be on a line with the upper row of the bones of the carpus, or on a line with the end of the first compress, and so that one may begin where the other ends, though on opposite sides of the wrist. Fasten these by a few turns of a roller loosely applied around the hand and wrist; then place the two splints in their position, one on the front, the other on the back of the forearm, extending them from the fingers up to the elbow, and bind them there by the spiral bandage, as in fracture of both bones of the forearm. After a few days, increase the tightness of the bandage moderately and make a slight extension of the joint, in order to prevent anchylosis. If instead of the bulging on the back of the hand, as generally seen, it should be on its front, we have only to change the relative position of the compresses, and then pursue the same plan.

## FRACTURE OF THE METACARPAL BONES

Is generally caused by heavy weights falling on them, and producing such a degree of contusion as to require our closest attention to combat the inflammation. In this case, we should employ a splint carved out to fit the forearm and hand, placing a small mass of cotton under the palm, so as to preserve its concave character, and then allow the limb to be open in the splint, till by leeches, cold washes, &c., we have reduced the inflammation. If, however, the fracture is produced by a fall on the hand we shall most frequently find the fracture in that of the little finger, this being one extremity of the arch formed by the metacarpal bones, and the one most exposed to the shock in falling. To dress this accident, place a mass of cotton in the hollow of the hand, and bandage the limb to a splint with a broad palmette or hand-piece; taking care that the splint extends from the ends of the fingers, up to near the elbow, in order to prevent the action of the flexor muscles.

### FRACTURES OF THE PHALANGES,

If simple, should be treated by first covering the finger with a spiral bandage, and then keeping it in a proper position by means of four small splints of binder's board; those on the front and back of the finger reaching from its extremity as high as the wrist, but the two lateral ones extending only the length of the finger. All these being padded with cotton should be confined by a second spiral of the fingers, the roller in each case being under an inch in width. Attention should be especially given in these fractures to the state of the joints, and passive motion be early made, as a stiff finger is a most serious inconvenience.

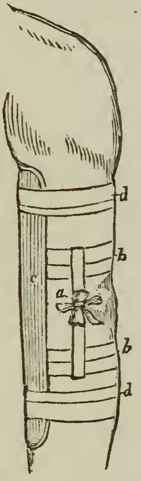
### FRACTURE OF THE OLECRANON.

In this injury the upper fragment is drawn up by the action of the triceps muscle. All the means of treatment have, therefore, the same object, viz., the bringing it down, or the placing of the two fragments as closely in contact as possible, in order to diminish the amount of ligamentous union. When from excoriation, or other accidents, one method is not available another may be substituted, as all have some points which recommend them in particular cases.

### SIR ASTLEY COOPER'S APPARATUS

Is composed of two strips of muslin, or tape, each about half a yard long; of two short rollers; of another roller of the ordinary length, and a light splint made sufficiently long to extend from the margin of the axilla about half way down the forearm. Then, the patient's forearm being extended, and the upper fragment pressed down until it touches the shaft of the ulna, a strip of linen is to be applied above and below the joint, and one of the short rollers passed round the limb above, and the other below the olecranon, to secure them, as at *b b*. The extremities of each tape being reflected and tied together, as at *a*, draw the rollers nearer to each other, and place the upper fragment of the olecranon in the closest apposition possible to the lower. Lastly, the split splint, *c*, well padded, is to be applied along the front of the arm, and secured by a bandage, *d d*, the latter being frequently wetted with an evaporating lotion. Care should be taken in setting this fracture to prevent the integuments being pinched between the fragments, lest it should prevent their union.

*Fig.* 154.



### DESSAULT'S APPARATUS FOR THE SAME

Consists of a strong pasteboard splint long enough to cover a part of the arm and forearm, and shaped so as to accommodate itself to the bend of the elbow, when the arm is in a semiflexed position; and of a roller five or six yards long and two and a-half inches wide, with some compresses or lint. Then whilst the limb is maintained by two assistants in semiflexion, the surgeon proceeds to cover in the hand and forearm with the roller; as he approaches the elbow an assistant draws the skin, which is here usually wrinkled, gently upward, to prevent it being caught between the fragments, and the surgeon pushes down the fractured extremity of the olecranon, in order to place it in contact with the body of the ulna. He now confines it in this situation by means of a few turns of the roller, carried round the joint in form of a figure of 8, as in the bandage for phlebotomy; and the elbow being at length covered, carries the roller spirally as far as the axilla, in order to compress the triceps, and prevent its action on the upper fragment. The carved splint being then well padded with the lint or compresses, is applied along the front of the arm and forearm, and fixed by a succession of oblique turns of the remainder of the roller, carried down to the wrist.

### THE HOSPITAL APPARATUS.

At the Pennsylvania Hospital, the apparatus for the treatment of this injury consists of two, two and a-half inch rollers; a splint to extend from the middle of the arm to below the middle of the forearm, of the width of the arm; and of some cotton or tow, to fill up the hollow at the bend of the arm.

The forearm being then extended on the arm, and the upper fragment brought down, and held by an assistant, apply the ordinary Spiral of the Upper Extremity from the fingers up to the shoulder, making figure of eight turns around the elbow so as to keep the fragments in apposition, and applying the bandage firmly around the arm, to prevent the action of the triceps. Then apply the tow to the bend of the arm, and bind the padded splint on its front by a second spiral bandage. After ten or twelve days, a slight degree of flexion is to be made at the elbow and gradually increased to prevent stiffness, the fracture being maintained in its position by the fingers of the surgeon, during this movement.

### BOYER'S METHOD.

According to this surgeon, the indications are to keep the fragments as closely as possible in apposition, without uselessly fatiguing the muscles by complete and constant extension of the forearm; and also by rest, to favour the formation of the ligamentous substance, without allowing the joint to become stiff.

In order to do this he advises that the forearm should be slightly *flexed* on the arm, so as to make an obtuse angle with it, and then an ordinary spiral bandage applied from the fingers to the elbow. The fragment being now drawn down, a narrow strip, or long compress, is placed behind it, and fastened by crossing its ends in a figure of 8 around the forearm; after which the bandage is continued over it in the form of several figures of 8, and then carried by spiral turns up to the shoulder, so as to compress the triceps. To guard against anchylosis, motion should be made at the joint about the twentieth day, and at the forty-fifth the cure is usually complete; the union being then quite firm and, as he says, as solid as it ever will be. Should there be much swelling or pain he advises that the bandage should not be applied, or the reduction of the fracture attempted, but the limb be simply placed on a pillow, and the inflammation treated by local means. If the inflammation does not disappear by the twentieth day the case may be left to nature; a number of instances, which he reports, having shown that even when thus left it will gain as much strength and freedom of movement as when confined more closely.

### THE CARPO-OLECRANIEN HANDKERCHIEF OF M. MAYOR

Has been already mentioned. It will answer very well, in many cases of this fracture, as a provisional dressing.

### THE UNITING BANDAGE OF GERDY

For transverse wounds and for fractured patella is also applicable here, but as its use is more frequent in the patella than elsewhere, I shall reserve its description until I treat of that accident.

When the fracture of the olecranon is compound, or complicated with severe contusion, the effects of the inflammation on the joint renders its treatment the most important indication, and it will be better, therefore, to place the limb in the carved angular splint before spoken of, and confine it by a few strips of Scultet's bandage, employing leeches, cold washes, &c., as in compound fractures of the condyles of the humerus, than to use either of the dressings just mentioned.

### FRACTURE OF THE CORONOID PROCESS OF THE ULNA,

If it should ever be found, will be recognized by its simulating dislocation of the bones of the forearm backwards. By pulling the forearm, and at the same time flexing it, the dislocation is easily reduced, but returns again immediately on the force being removed. In order to prevent this, flex the forearm on the arm, using the angular splint directed for the front of the arm in fracture of the condyles, and binding it firmly, so as to keep the elbow flexed for several weeks; the action of the brachialis internus, which is liable to reproduce the deformity, being prevented by the turns at the elbow. This accident is, however, a very rare one, Dr. Physick having seen but one case which he thus treated, and Sir A. Cooper and Mr. Liston having, also, seen but one or two instances of it. From considerable observation I am induced to believe that a fracture directly through the greater sigmoid cavity of the humerus has been often mistaken for this injury, and though I cannot deny the examples cited, a practioner should be on his guard when anticipating the existence of fracture of the coronoid.

For remarks on the Diagnosis of Injuries of the Elbow, see Dislocations of the Forearm.

# CHAPTER IV.

## OF FRACTURES OF THE LOWER EXTREMITY.

In few cases requiring surgical attention has there been as great a variety in the plans of treatment as in the fractures to which I now refer. Almost every year, and from every section of the country, we have accounts of some new modification, or some "decided improvement in their apparatus, which, in the opinion of the inventor, and from the decided testimony of one or two perfectly cured cases, must supplant everything heretofore known;" when, perhaps, the great and improved modification, consists only in the substitution of narrow strips for broad bands, or in the difference of a buckle, or the peculiar shape of a hinge. To refer, then, to all these, would be as useless as uninteresting; and I shall, therefore, present only the more original plans, premising a few remarks on the duties of the surgeon in the preparation of the general means requisite for their treatment.

When called to a fracture, or even a supposed fracture of the lower extremity, our first duty should be to consider in what way the patient may be most readily moved and prepared for his dressing, and 2d, how that dressing is to be obtained.

1st. How are we to prepare for the removal and dressing of the patient?

In injuries of this nature, a shutter, door, frame, or settee, is usually selected, on which the patient is placed encumbered with his ordinary dress, and as we know that for the proper treatment of his case perfect repose of the limb is absolutely essential, our thoughts naturally turn to his place of rest during the treatment, and to the selection of the bedstead and bed. The first will be readily found in the ordinary single bedstead, provided it is low and narrow, with a low head-board, and without a foot-board. This should be made into what is called a Fracture Bedstead, by first drawing the sacking-bottom as tightly and drum-like as possible; or if slats can be had, by placing them in their position, and cutting in the centre of either a hole large enough to admit a pot; then nail on the underside of the bedstead, at a distance corresponding with the width of the pot, two strips grooved or ploughed like the strips in which an ordinary counter-draw runs, so that they may receive the rim of the pot, and allow of its sliding in and out under the patient; or a closed stool, or pot concealed in a box, may be placed beneath the opening when it is required, and raised to the proper height by placing stones beneath it. If a number of these bedsteads are required, as in a hospital, it will be found most useful and cleanly to have them made of iron, as they are more readily preserved from bugs, &c.,

After the bedstead, we should next prepare a hair or firm and even mattress to fit it, by cutting out a piece of the mattress to correspond with the hole in the frame of the bedstead, sewing the cut edges of the ticking together, and stuffing it so that the edges of the hole may not be hard or likely to chafe the buttocks. We then place over this a sheet with a similar hole in its centre, and arrange on it the preliminary portions of the apparatus to be used; after which attention may be given more immediately to the treatment of the patient. Having carefully removed his clothes, &c., we should prepare to remove him to the bed. To do this properly, see that the open side of the settee corresponds with the side of the bed, and the head of the patient with its head, especially if the room is narrow; otherwise we may be compelled to carry the settee out of the chamber, and perhaps down stairs, in order to turn it, as I have occasionally seen done, at the expense of much unnecessary pain and trouble. We next procure three assistants, and having informed them of their duties, place one at each shoulder of the patient, so that they may face each other, the third being at the limb on the sound side, and the surgeon himself taking charge of the injured limb. Then direct the two assistants at the shoulders to pass one of their arms under the patient's neck and shoulders; let them slide the other hand under his buttock, and clasp each other's fingers in what is known as the sailor's grip, or, in other words, grasp hands by making the palmar side of their fingers touch.

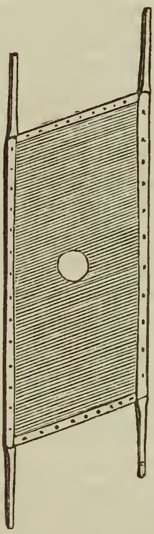
The third assistant, now holding the sound limb, let the surgeon place one hand under the seat of fracture, the other under the calf of the leg, if the fracture is in the femur, and at the word to move, let the assistants lift and carry the patient down to the foot of the settee, so as to get free from it, and then passing, one on each side of the narrow bedstead, place their burthen so that the lower part of his buttocks may correspond with the upper edge of the hole in the mattress, when the dressings may be readily applied. If instead of a fractured thigh it is a fractured leg, the arrangements should be the same, except that the surgeon should grasp the leg with both hands, one being at the knee and the other just below the seat of the fracture, or at the ankle.

Although these directions may seem minute, yet are they absolutely necessary to prevent the suffering of the patient, and the awkwardness which is too apt to result from a want of attention to them; assistants or inconsiderate surgeons very often so placing themselves, that on moving the patient they come directly between him and the bed, thus necessitating their lying down, or crawling across the bed in order to get out of the way.

Where it is found difficult to prepare the bed as thus directed, a very excellent and simple substitute will be found in a frame made of sacking or strong cloth, nailed on two narrow strips several inches longer than the bed, and joined by two transverse pieces a little wider than the bed.

This being placed on an ordinary firm mattress, and a sheet with a central hole placed over it, the patient will lie as on an ordinary bed till he requires a stool, when assistants at the head and foot of the bed, by raising the frame like an ordinary hand-barrow, and placing its ends (Fig. 155) on four heavy chairs, can readily air the bed, or even remove it, and of course can also easily pass a pan under the frame to receive the discharges.

*Fig.* 155.



Having now completed these arrangements we should proceed to the second head, or the

Preparation and application of the apparatus.

The kind of apparatus required for the treatment of a fracture must necessarily depend upon the injury. In fracture of the femur below its neck, the extended position, as recommended by the French surgeons, is almost the only one employed, as far as I know, in the United States; the apparatus of Dessault, as modified by Drs. Physick and Hutchinson; the apparatus of Boyer, modified by Hartshorne; or that of Hagedorn, modified by Prof. Gibson, being those most frequently used in this city, though I have occasionally seen the plan of Amesbury, and of Prof. Nathan R. Smith, in use, in special cases.

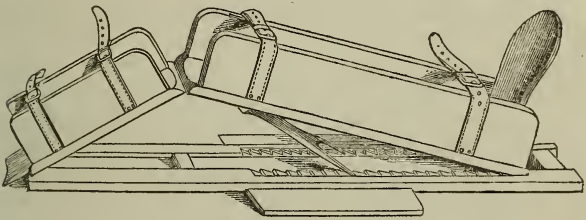
# CHAPTER V.

## OF FRACTURES OF THE FEMUR.

### IN FRACTURES OF THE NECK OF THE FEMUR,

Within the capsule, especially in old persons, as the union will generally be ligamentous, it is sufficient simply to bend the limb on itself on a double-inclined plane, such as that of Sir Charles Bell, Chapman, of England (Fig. 156), Amesbury, &c., or to use the method of Dupuytren, in which a double-inclined plane is formed by cushions or pillows, covered by a common sheet.

*Fig.* 156.



### DUPUYTREN'S PLANE

Is made by three or four cushions, decreasing in size from below upwards, placed under the ham; and so disposed as to form a double-inclined plane. On the upper portion of this the thigh is made to repose, while the leg, in a state of flexion, rests upon the lower, and the limb is maintained in its position by means of a sheet folded like a cravat, the central

21

part of which embraces the foot, while the extremities are attached to the sides of the bed.

Simple, however, as this is, the plan frequently pursued by surgeons in this city is more so, and answers I believe equally well. It consists in doubling an ordinary pillow on itself, and placing it under the ham and leg, thus making a plane of the simplest kind, and giving, by the addition of a band to fix the foot, all that is requisite for the treatment of this injury. It has also the advantage of not causing excoriation by pressure, &c., and as the class among whom this accident is most frequently seen are advanced in life, it is a point that should by no means be overlooked.

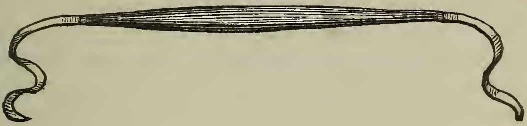
In fractures of the shaft of the bone, the extended position being, as before stated, preferable to the flexed one, the treatment is entirely different. In this accident, owing to the shortening produced by the contraction of the powerful muscles which surround the bone, the surgeon is compelled to employ some means of making extension and counter-extension, as it is usually termed; though, in reality, the means of extension should always be the hands of the surgeon, and the bands be only used to preserve the extension when he has made it.

To keep up extension, various bands have been employed, but it matters little of what they are made, provided they are flexible, soft, and porous, especially the latter, in order not unduly to promote the insensible perspiration, and thus favour excoriation. But as these qualities are seldom found united in the same article, most of the means of preserving extension are made of two substances, the best of which are brown holland linen, and buckskin. These may be employed either as described under the band of Dr. Coates, or in the gaiter of Dr. Physick, which is a modification of that of Petit.

### DR. COATES' BAND FOR PRESERVING EXTENSION

Is made of a piece of brown holland, slightly biassed, but leaving the central threads continuous throughout, from fifteen to eighteen inches long, if designed for an adult; two inches wide in the middle and narrowing on each side, rapidly at first, then slowly, towards the extremities, which are an inch in width (Fig. 157). This should be lined throughout nearly its whole length with thick buckskin, a very little wider than the linen, the latter being simply basted to the former by stitches which dip but half way through the skin, in order that they may not produce irritation, two pieces of tape, or webbing, each an inch wide, being then sewed securely to the ends of this band, so as to make it long enough to go over the lower end of the splint to which it is to be fastened. In applying it, place the centre over the tendo-Achillis, and bring the ends round above the malleoli, to the front of the ankle; cross them on the top of the instep, and carrying them down, knot them beneath the hollow of the foot a short distance from the sole; when the tapes may be carried over the end of the splint, and tied.

*Fig.* 157.

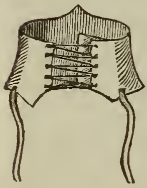


Where this band cannot be readily obtained, a common silk or Madras handkerchief, folded into a similar shape and applied like this band, answers quite as well. But in some cases, owing to the irritability of the patient, or to the extension being made by the band instead of by the hands of the surgeon, or owing to a want of attention to the smoothness of the band, or extreme tenderness in the skin of the patient, excoriations will show themselves. It is desirable, therefore, by changing the means of preserving extension, to bring the pressure to bear on different points, and we may then resort to what is known in Philadelphia as

### DR. PHYSICK'S GAITER.

This is made of buckskin and kid, of cloth and buckskin, or hollands and buckskin; but in either case the buckskin should go next to the skin, as it is the softest, most porous, and flexible of all these substances. Cut out of either of these substances two pieces of the shape of the figure, and make it eleven or twelve inches long at its greatest length, and eight inches at its least, for an adult, and about four inches in its other diameter. Work eye-let holes in the ends, to receive the cord which laces it to the ankle, and sew a piece of buckskin on the inside of one end, so that it may come under the lacing when the gaiter is applied, and thus prevent the cord from pressing on the skin. Lastly, sew on two broad tapes or bands, of about three-fourths of a yard long, in order to pass to the end of the splint.

*Fig.* 158.



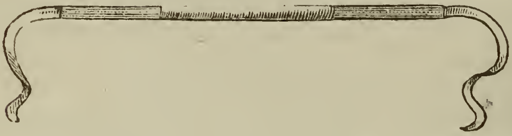
In applying it, place a layer of carded cotton on the surface which is to be next the skin, and lace the gaiter smoothly round the ankle, from an inch above the malleoli down on to the front of the instep. If the use of this causes pain we should at once look to it, and if a slight change in its arrangement does not relieve it, rub the heel with whiskey or some slightly stimulating liniment. But should it produce excoriation, we must then resort to some other band, such as the Handkerchief of Dr. Barton (Fig. 128) before treated of, and with these means of preserving extension, we shall probably have all that is necessary. Every practitioner, if he has had much experience in the treatment of fractures of the thigh, will doubtless admit the necessity of watching closely against excoriations, and also the great importance of the extending force being made to act directly in the axis of the limb. I need, therefore, not apologise for recommending an additional mode of accomplishing this object. Form with a bandage of flannel four inches wide (if an adult) a series of figure of eight turns, embracing the leg and ankle or instep as in Fig. 61. Then stitch orpin firmly on the portion of this which covers the malleoli, two broad tapes, and tie them on the lower end of the splint, as before directed. The extension will thus be made from the malleoli; the bandage will be elastic, and, therefore, not painful, and the perspiration being readily absorbed, there is but little tendency to that maceration of the cuticle which is so often the starting point of ulceration.

Let us now look to the means of preserving *counter-extension.* The padded band of Dessault, or Boyer, the bandage doubled several times on its length, or the use of a thick cravat, may all be objected to as frequently causing excoriation of the part; and I shall, therefore, confine myself to the consideration of *Coates' Perineal Band*, which will be found to be one of the best means that we can employ.

### COATES' PERINEAL BAND

Is made of a piece of brown holland long enough to go round the perineum, in the line of the groin, and reach above the crista ilii both before and behind. For an adult it should be three or four inches wide. Double this in its width, and sew the edges firmly together, leaving one end open and closing the other; then turn it inside out like a bag, and pour in bran or chaff, sufficient to fill it lightly; then quilt one-third of the closed extremity so as to flatten it to the thickness of half an inch, and pour in a little more bran, stuffing it firmly till the central third is quite round and firm. After this close the open end, and quilt the terminal one as before, attaching to each extremity two broad tapes three-fourths of a yard long. Next, take a piece of soft buckskin about three inches and a-half wide, and about half as long as the band; double it, and stitch the edges together in order to form a tube with the ends open, so that when the band is about to be applied it may be slipped over and cover the part which is to press on the groin; then the seam being turned aside from these parts, secure it firmly to the band by a few stitches. When soiled, the buckskin may be easily changed, without requiring a new band.

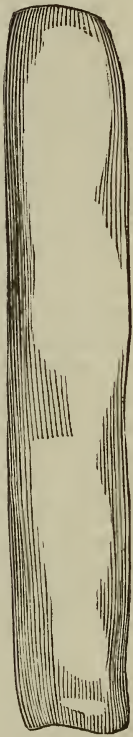
*Fig.* 159.



The addition of this piece is a great improvement to the ordinary band, and, according to the experience of the inventor, as well as from my own, seldom or ever produces irritation.

Junct-Bags, or cushions, are intended to prevent the pressure of the splints against the sides of the limb, as well as to equalize lateral pressure. They are made of muslin of the length of the limb, or, rather, long enough to extend on its outside from the pelvis to the external malleolus, and on the inside from the perineum to a point a little above the same process internally. One end of the bag being sewed up, is then filled with bran or chaff till moderately full, and the open end being likewise closed, will form a cushion of the width of the splint, and like Figure 160.

*Fig.* 160.



In connection with this subject, and before describing what remains of the apparatus for fractures of the femur, I cannot omit referring to the remarks of Dr. Coates in relation to the delay attending our preparations, as they contain points of much practical importance to the young surgeon. "There is scarcely ever," says he, "a necessity for rapid action in a case of fractured leg or thigh. But as it would be wrong to allow the patient to undergo the gradual shortening of the limb from continual muscular action, while the surgeon rides off for his splints, or while he superintends their preparation in the shop of some carpenter who never saw what he is required to make, let him secure the limb by temporary means, and thus save his patient the exquisite pain of involuntary motions; the irritation from the pressure of the fragments upon lacerated muscles; and the increased force required to overcome their contraction. Place the patient, therefore, on the bed diagonally, and with extending and counter-extending bands, made of towels, handkerchiefs, &c., employ one head-post, and the opposite foot-post, for securing him. After which, the surgeon can proceed coolly and leisurely for his apparatus; certain that his patient suffers but little, and that scarce anything is lost by delay."

### THE SPLINT CLOTH

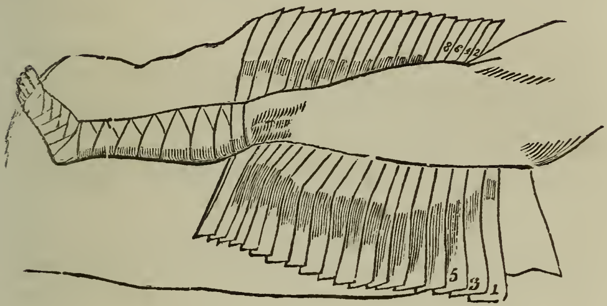
Is a piece of muslin a yard and a-half long, one yard wide, and intended to keep the splints together, by being wrapt around them.

The rolling of the splints in the splint cloth is not unfrequently a matter of considerable difficulty, in consequence of the pyramidal shape of the splints. To accomplish it with certainty, lay the splint cloth on the *floor* and roll the external splint first; being the least sloped it will generally be readily covered. Then hold it on its side in the position that it will take when applied to the limb, and stand the internal splint at the proper distance from it on the cloth. Let an assistant hold the external splint, and laying the inside splint flat, turn it over and over till it reaches the side of the cloth. Then wrapping it once or twice, make it turn back again till it reaches the position whence it started. It must be borne in mind by the young dresser, that the two splints should be most distant at their upper ends, in order to accommodate the greater size of the thigh.

### SCULTET'S BANDAGE,

Which is also often necessary in the treatment of fractures of the thigh, is made of strips of muslin about three inches wide, and of a length gradually decreasing from the first piece. This strip should be long enough to go once and a third round the upper part of the limb, each succeeding portion being one inch shorter. To prepare and apply the strips lay them down on a pillow or board (so that the whole may be readily placed under the limb without being deranged), placing each strip so that it shall cover only one-third of the preceding one. Then placing the limb on these *obliquely* in regard to their length, in order to favour their application, commence at the lowest part of the limb, and gradually ascend, drawing each strip moderately tight (Fig. 161). When it is necessary to change one or more of the strips,

*Fig.* 161



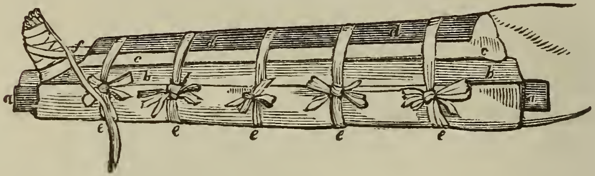
undo the bandage, and attaching the fresh band to the soiled one draw the latter out, and thus place the fresh one in its place without deranging the limb.

### THE EIGHTEEN-TAILED BANDAGE

Consists of a strip three inches wide, and as long as the limb, to which are stitched crosswise eighteen or more strips of equal width, sufficiently long to make a turn and a-half about the part, and cover in each other by about two-thirds. It was formerly used for the same purposes as the bandage of Scultet, but has been supplanted by it in consequence of the impossibility of changing a single strip, owing to its attachment to the centre piece.

The apparatus for fractured femur differ in their form. The Splints of Dessault consist of one for the outside of the limb, long enough to reach from the spine of the ilium to four inches beyond the foot; and of another extending from the perineum to the sole of the foot, both of the width of the limb. In the upper part of the outside one are holes to receive the counter-extending band; its lower end having only one hole, for the extending band. To these are added a splint for the front of the thigh, junct-bags, Scultet's bandage, &c., as shown in Fig. 162.

*Fig.* 162.



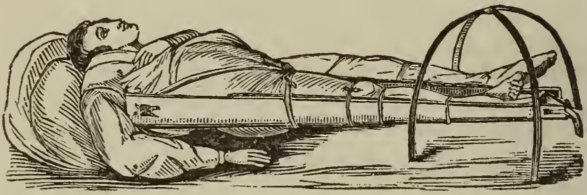
Being liable to the objection of not preventing lateral inclination of the pelvis, they are now but seldom used except by the French surgeons. Their application is shown in the cut.

### PHYSICK'S SPLINTS

Are a modification of these, the addition being in the length of the outer splint; in consequence of which its end reaches nearly to the axilla, thus making the counter-extension more in the line of the body, and preventing any inclination to that side. The addition, by Dr. Hutchinson, of a notched block over which the extending band is stretched, makes the direction of the extension more in the line of the limb. The remainder of the apparatus is the same as that just described. With slight modifications, this is the dressing now employed in the Pennsylvania Hospital; and as the experience of the large number of cases there treated proves it to be all that is requisite for simple fracture of the shaft of the bone, I can safely recommend it as the most simple of our means of treatment.

In its application, having arranged the patient, the bed, and the apparatus, as before directed, place the patient on the fracture-bed with his buttocks corresponding to the hole, and put the counter-extending band of Coates in the groin of the injured side. Then roll the splints in the splint-cloth so that the splints may be of the proper distance apart, and give them to an assistant. Place the gaiter, &c., on the foot, and, seizing the limb above the ankle with both hands, draw it gradually and steadily down (whilst an assistant makes counter-extension by the perineal band) till the limb is nearly the length of the sound one, or till the spasmodic contraction of the muscles is overcome. This may require five or twenty minutes, after which the splints and splint-cloth should be slid under and up the sides of the limb by other assistants. The splints now lying flat on the bed, place the junct-bags on them, and make their stuffing to correspond with the prominences and depressions of the limb; press the outer splint to the side of the limb against the junct-bag, and tie the counter-extending tapes through the holes at its upper part. Then the extending tapes being passed over the block, and one of them through the hole at the lower end of the outer splint, both are to be tied on the extremity of the splint, so as to secure the extension gained by the hands of the surgeon; he keeping up this extension till the bands are fixed and the outer splint in its place. The junct-bag being then arranged on the inner splint, and it turned up against the side of the limb, pass three pieces of roller under the hollow of the knee and slide them up and down the limb to their position, tieing them on the side of the splints so as to keep the whole apparatus close to the limb, and thus prevent lateral deformity. Looking now to see that the patient's body is perfectly straight in regard to his limbs, which may be told by seeing that the two anterior superior spinous processes are on the same level, measure from them to the internal malleolus of each limb, to see what is the difference in their lengths. Then place a hoop, bent as in Fig. 163, over the toes, to keep off the weight of the bed-

Fig. 163.



clothes, and the dressing is completed. If, after two or three days, or even ten days, we find there is still shortening of the limb, make the extension with the hands as before, and thus daily drawing on the limb, pull it down and tighten the bands till it is of the same length, or as much so as possible; a difference of a quarter of an inch not being preceptible in the gait of the patient.

Generally the reduction of this fracture is completed at the second visit; but I cannot too strongly caution the young surgeon against believing that the fractured femur will in all cases, or in the majority of them, be perfectly of the length of the sound one. In favourable cases the difference will scarcely be preceptible, but if attention is not paid to the position of the spinous processes he may readily deceive himself, and prove the limb as long or even longer than the sound one; a point of which some have boasted when speaking of the success of their treatment. If excoriation of the heel is likely to occur, the placing of a piece of kid spread with soap cerate on the part affected, or the substitution of some other means of preserving extension, so as to vary the point of pressure of the band, or daily frictions with soap liniment, should be resorted to. But during this process, or during any change in the apparatus, the extension and counter-extension should be carefully maintained by the hands of assistants.

In this method it is seen that the bandage of Scultetus, and other bandages, or short splints on the front or back of the thigh, are dispensed with; no advantage being derived from their use in the majority of cases; whilst we can, owing to their absence, examine the state of the fracture; apply cold washes to combat any inflammatory action, and yet not derange the limb by their application. Should the case, however, prove one of very oblique fracture, and especially at the upper third of the bone, the anterior and posterior short splint, with the application of Scultet's bandage to the thigh will, I think, be found of great service.

### BOYER'S APPARATUS

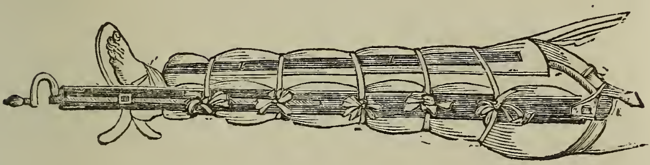
"Is composed of a splint of a particular construction for extending the limb; a foot-board; a padded belt or perineal band, which is buckled round the upper part of the thigh; two common flat splints of the length of the limb, one for the anterior and the other for the internal part of the thigh; and some junct-bags, tapes, and wadding.

"The outside splint is about four feet long and three inches wide. Along half its length runs a groove about half an inch broad, the extremity of which is covered with iron; to this groove a screw is adapted, which occupies its whole length, one end of it being supported against the plate of iron covering the extremity of the groove, and the other made to fit a handle by means of which it can be screwed up. On the inside of this splint a contrivance for holding up the foot-piece is fastened to the screw, and the upper part of the splint is received in a sort of pouch or bag adapted to the external side of the perineal or thigh-belt. The sole-piece, or foot-board, which has two branches at its inferior part to steady it when resting on the bed, is made of iron, and covered with soft leather. This is connected by means of a mechanical contrivance, as just mentioned, with the screw. To that part of the sole which is near the heel is attached a broad piece of soft leather, which being split on each side into two straps, serves for fixing the sole to the foot.

"The perineal band is of strong leather, covered with buckskin, and well stuffed with wool; near the place where its two ends are buckled together on the limb a little leather pocket is sewed for receiving the upper end of the external splint. The patient being then properly disposed upon the bed, a splint-cloth is passed under the limb, and laid upon five tapes. In the next place the perineal band is applied, the surgeon having previously surrounded the upper part of the limb obliquely with a cushion of wadding, four fingers' breadth wide, and the length of the thigh-belt, or with the junct-bag, in order to moderate the pressure of the latter, and render it more supportable. The hollows of the sole of the foot and lower part of the leg are also filled up with wadding or tow, and the foot-piece is fastened to the former by means of the soft leather straps attached to its under surface, which pass round the lower part of the leg. Should, however, these straps appear insufficient to fix the iron sole firmly to the foot, an extra band of calico or linen may be applied in the same manner (Fig. 164).

"That done, the surgeon proceeds to the reduction of the fracture, and after adapting the upper extremity of the splint to the pouch of the perineal band, the foot-support being connected with the splint, and the cushions, and the anterior and internal splints applied, the whole is fixed by means of the tapes, as in the ordinary apparatus for fractures of the thigh. Lastly, by turning the winch, the iron sole is lowered, drawing the foot, to which it is attached, along with it; and the superior extremity of the splint being pushed upward the member can be elongated to the necessary extent."

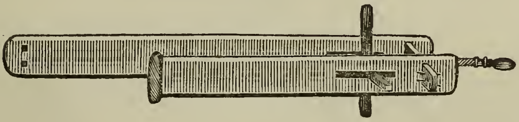
*Fig.* 164.



### HARTSHORNE'S SPLINTS.

These are generally spoken of as a modification of Boyer's, but differ so much from them as to be almost entirely new. They are composed of an outer splint long enough to reach from four inches below the heel nearly to the axilla; and of an inner splint which goes from the same point up to the perineum. In the lower extremity of each of these is a long mortise in which the foot-board slides, or is moved by the screw. The upper end of the inner splint is covered with a pad of horse-hair, which is again covered by buckskin (Fig. 165). An ordinary gaiter and a handkerchief complete the apparatus. In its application, fix the gaiter or band on the foot, and pass the splints on each side of the limb till the inner or padded one

*Fig.* 165.



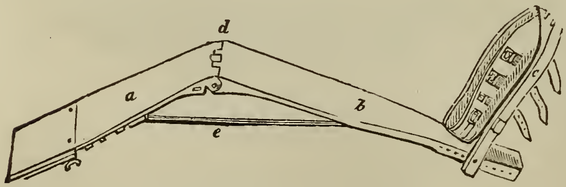
touches the perineum. Then attach the tapes of the gaiter to the upper block or foot-board, and by turning the screw, draw it down, the limb following this movement till the perineum bears on the pad, when it is stopped, and the counter-extension made by means of the padded end of the inner splint.

Junct-bags may be placed between the splints and the side of the body and limb if they press too much against it, but generally this is not the case, and in cases of compound fracture, where they would be soiled by the discharges, it is desirable to omit them. It is chiefly, I think, in cases of this kind, that these splints can be used to the greatest advantage, as the extension and counter-extension being kept up chiefly on the inner side, we can remove the outer splint, or cut out an oval piece corresponding with the wound, if on the outside of the thigh, and thus dress the wound, without taking off the extension. Care must, however, be observed in the use of this splint, that the pressure upon the integuments of the perineum does not produce a slough.

### AMESBURY'S APPARATUS FOR FRACTURES OF THE MIDDLE AND LOWER THIRD OF THE FEMUR

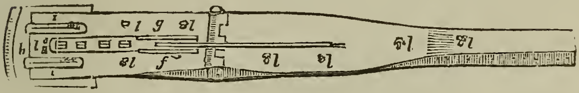
"Is divided into three portions, independent of splints and straps; one is for the thigh, *a*, Fig. 166; another for the leg, *b;* and the third for the foot, *c*. There are two thigh-pieces made to each apparatus, one of which is bevelled off at the lower end

*Fig.* 166.



right, and the other to the left; so that when one of them is fixed to the leg-piece, which is hollowed out to receive the back of the leg, the leg and thigh-piece together are adapted to the natural line of the right limb; and when the other thigh-piece is joined to the leg-piece, they are adapted to the natural line of the left limb. This arrangement Mr. Amesbury considers necessary, in order to preserve the figure of a perfectly-formed limb, which is not straight, but turns inwards a little at the knee. The leg and thigh portions are connected by means of a little steel or brass pin, *d*. Behind the apparatus is a steel bar, *e*, coated with brass, and fixed to the back of the leg-piece. To the upper end of this bar is fixed what Mr. Amesbury calls a brass foot, to which is attached a bolt acted upon by a spring. There is a hole in the centre of this brass foot, which is traversed by the bolt in the transverse direction. At the back of each thigh-piece is a rack, *g*, Fig. 167, with several projections, each having a hole bored through the middle, for the purpose of receiving the bolt attached to the brass foot-piece. The foot-piece is so connected with the steel bar that it may be easily fixed upon any of these projections. When fixed upon either of these, except that nearest the leg-piece, the leg and thigh-pieces become joined together, so as to form a double-inclined plane (see Fig. 166); the angle of which may be varied at pleasure by altering the position of the brass foot-piece from one of the teeth or projections of the rack to another. At the upper end of the thigh-piece is a sliding brass plate, *h*, Fig. 167, so adapted that it may be applied to either of

*Fig.* 167.



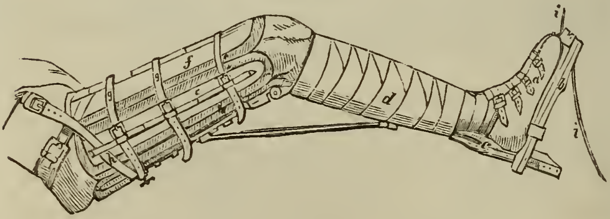
the thigh-pieces at pleasure. This contrivance allows of the thigh part of the apparatus being adapted to thighs of various lengths. The upper end of this plate is turned off, so that, when it is properly padded, it may bear against the tuberosity of the ischium without injuring the integuments. At the back of the sliding plate are placed a couple of brass bars, *i i*, which answer the double purpose of rendering the sliding plate more secure when it is fixed upon the thigh-piece, and of preventing the pelvis strap, to be noticed presently, from slipping off the apparatus. There are little studs, *l*, placed at the back of the apparatus, for the purpose of receiving the straps by which it is confined to the limb.

"The pelvic strap is of leather, furnished with a sliding pad, and sufficiently long to reach round the thigh and the pelvis.

"Three short splints long enough to reach from the upper end of the thigh to the lower part of the condyles of the femur are also required to be placed upon the thigh.

"*Application.*—The apparatus and splints being properly padded, the surgeon places the pelvis-strap between the bars and the plate or sliding portion; taking care previously to apply a single-headed roller, *d*, as in the cut, spirally about the leg, from the toes to the knee. This being done, an assistant takes the

*Fig.* 168.



small of the leg in one hand; places the other under the knee to raise the limb, and at the same time to keep the knee bent and the thigh extended, while the surgeon places the apparatus under it. When the limb is properly placed, the shoe, *a* (Fig. 168), previously padded in the inside, is buckled to the foot, while the foot-board, *b*, and leg-piece, are placed at nearly right angles, in order to give the foot support and steadiness. The leg is then supported along the whole of its under surface in order to give it an equal bearing upon every point of the apparatus, and this is done by means of tow or wadding, *c*, placed under the small of the leg, between the long pad and the leg-piece. The leg is then fixed upon the apparatus by a roller carried spirally round both from the angle to the bend of the knee, or by straps properly padded. To confine the fractured parts in their natural position the assistant takes the apparatus and the knee between his hands, and extends the thigh gradually in a line with the thigh part of the apparatus, which the surgeon supports against the back of the limb. Then after coaptating the fragments of the bone he applies the splints; the first, *e*, on the outer side of the thigh, from the great trochanter to the lower part of the outer condyle; the second on its inner side, reaching from the pubes to the lower part of the inner condyle; and the third, *f*, upon the fore-part of the thigh, from a little below the superior anterior spinous process of the ilium to the base of the patella. These splints are kept in place by the straps, *g g g*, fixed to the studs on the back part of the apparatus. Lastly, the pelvic strap, *h*, is to be carried round the limb, under the strips of leather of the splints, and made to cross on the outer side, while the buckle-end, with the sliding pad, is carried round the pelvis and made to meet the other end in front, where it should be fastened. The tapes, *i i*, serve for fixing the lower part of the apparatus to the foot of the bed." This and others of Mr. Amesbury's apparatus, are thought by him to offer peculiar advantages; and as he has written two large octavo volumes on the subject of fractures, I would refer those desirous of learning his views more fully, to the work itself.

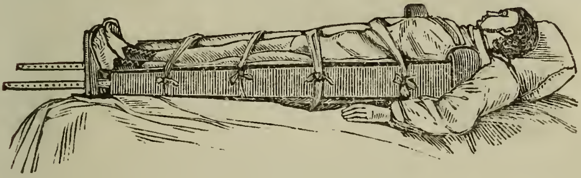
Several splints, very similar in principle to those of Mr. Amesbury's, are now manufactured to a considerable extent in some of our New England States, and circulated all over the country. As a general rule, they are objectional from their complicated character, and like those of Mr. Amesbury can only be prepared by the manufacturer, whilst those which are equally as good, can be made by any carpenter after the pattern of Drs. Physick and Hartshorne.

### GIBSON'S MODIFICATION OF HAGEDORN

Consists in two splints half an inch thick, formed at the upper extremity like the head of a crutch; five inches wide just below this head; five feet and a-half long for an adult, and tapering towards the lower end, which is about two inches wide. These lower ends for the extent of a foot are straight, and have six or eight holes at equal distances large enough to receive a stout peg intended to secure the foot-board. Shoulders are made in the splint just above the last peg-hole, to prevent the foot-board from ascending. The foot-board itself is made of seasoned, tough wood, an inch thick, twelve inches long, and nine wide. In this are three rows of slits half an inch wide, and an inch and a-half long, intended for the straps of the gaiters which are to secure the feet to the board; two other slits receive the ends of the splints, thus making eleven perforations in the foot-board. The gaiters are like Physick's gaiter, with two additional straps; so that there are two near the instep and two near the heel, long enough to pass through the foot-board and tie on its back.

In its application, the bed being prepared, as before mentioned, and the patient placed straightly on it, the gaiters are applied to both feet, and the fracture set. The splints with junct-bags, or else the splints themselves padded, are then applied, and the sound limb bandaged all the way up to one splint, and then the foot-board fastened to both of them. The feet being protected by two small cushions beneath them, are to be secured to the foot-board by passing the straps through the holes and tying them on the outside; after which, both splints are to be secured to the patients body by four or five pieces of bandage (Fig. 169). The crutch-like heads are merely so shaped to prevent accidental injury of the soft parts about the axilla, and have no reference, as many have supposed, to counter-extension.

*Fig.* 169.



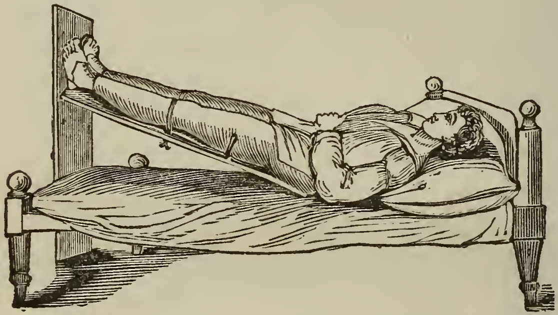
In this apparatus both limbs are confined, and the counter-extension is made at the acetabulum of the sound side by means of the sound limb. Consequently, we must guard against any bending of the sound knee, as that would at once do away with the use of this limb as a splint, and permit shortening. The addition of a short splint behind the knee-joint will be found an additional precaution against any flexion of this part.

A very simple apparatus of the same surgeon, and especially well adapted to the treatment of fractures of both thighs, is to be found in the following plan:

### GIBSON'S SIMPLE INCLINED PLANE

Is composed of a board sixteen inches wide, two feet four inches high, and with six mortises near its upper extremity, which is placed vertically; another board, of similar breadth and length, is placed horizontally; and a third, three feet long, and extending from the extremity of the horizontal one to within ten inches of the top of the upright one, forms an inclined plane: the whole joined together, forming a triangle (Fig. 170).

*Fig.* 170.



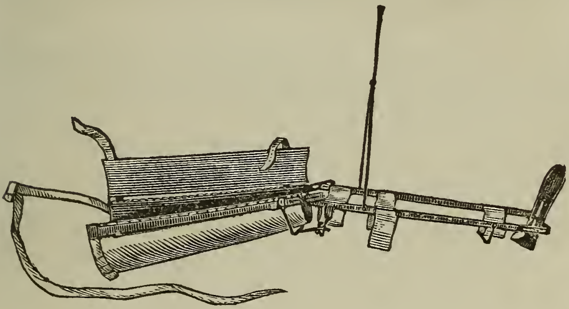
At the lower end of the inclined board is an opening six inches wide and eight long, to allow of the passage of fæces and urine to a vessel below. There are likewise two mattresses, two foot-cushions, and a pair of gaiters. The larger mattress, of the length and breadth of the inclined board, is two and a-half inches thick, and fastened to the board by straps on its edges. The smaller mattress fills up the opening for the passage of fæces, &c. The gaiters and foot-cushions are as before described; and lastly, there are two round pins, each six inches long, which are passed through holes in the inclined plane. Then the patient being placed on this, as seen in Fig. 170, the fastening of the feet makes the extension, and the weight of the body the counter-extension, thus placing the limbs in an easy position; in one very favourable to the reduction of any inflammation, and especially applicable to the cases of fracture just mentioned.

When, from peculiar circumstances, we wish to allow a certain degree of motion to the limb, we may find it useful to employ the apparatus of

### NATHAN R. SMITH, OF BALTIMORE.

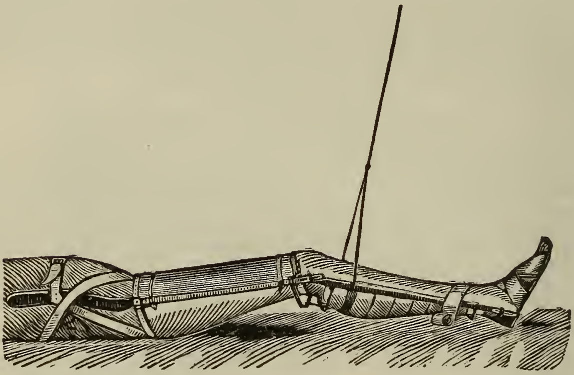
"This consists of four pieces, viz.: two concave-inclined planes, one of which is adapted to the inferior surface of the thigh, the other to that of the leg, and united by a hinge corresponding with the knee. The third piece is for the foot, and the fourth, connected to the thigh-piece, extends up the side of the body (Fig. 171). The limb being placed in it, as in Fig. 172, is then to be suspended." It is, however, a somewhat complicated apparatus, or at least one which, like the splints before mentioned, is not readily prepared at the moment. When applied, it makes, however, a very light and excellent double-inclined

*Fig.* 171.



plane. The figures give a good idea of it, and those who may wish to construct one will find a minute account of it, in all its parts, by Prof. Smith, in Gedding's Baltimore Med. and Surg. Journal, vol. i., 1833, and in the Transactions of the American National Medical Association, vol. ii., 1849.

*Fig.* 172.



# CHAPTER VI.

## FRACTURES OF THE PATELLA.

In transverse fractures, the upper fragment being drawn up by the action of the quadriceps femoris, the indications in the treatment are to overcome the action of this muscle, and bring the fragments as closely in apposition as possible, in order to shorten the ligamentous union, and thus preserve a more perfect use of the limb. To do this, various means have been proposed by Dessault, Amesbury, Sir A. Cooper, Sir E. Home, Mogridge of Devon, Dorsey, Mayor, Gerdy, &c., &c.

### DESSAULT'S APPARATUS

Consists of a splint three inches wide, long enough to reach from the tuber ischii beyond the heel; two, two and a-half inch rollers eight yards long; a two inch band of the length of the limb, and some tow, &c. Then the thigh being bent on the pelvis, and the leg extended on the thigh, the limb is supported by an assistant, and the long band placed on the front of the limb, and held by other assistants in its place, until fixed by one of the rollers, in an ordinary spiral bandage, up to the knee. Two slits corresponding to the knee-pan are then made in the band, to allow the fingers of the surgeon to pass through and bring down the upper fragment, when the roller being resumed, should be carried round the joint in several figures of 8, and then continued up the thigh, to compress its muscles and fix the end of the band. The use of this band is now seen to be, to fix the turns of the roller, preventing those of the leg from ascending, and those of the thigh from descending, and also to guard against flexion of the knee; to assist in which whilst the limb is still elevated, the surgeon applies one end of the splint under the tuber ischii, and then filling up the inequalities of the limb with cotton or tow, extends it on the whole back of the extremity, confining it to the limb by simple spiral turns of the second roller.

This apparatus is very simple, but would perhaps answer as well without the band, the roller, if properly applied, not being liable to slip after the application of the splint.

### DORSEY'S APPARATUS

Is also simple, and consists of a piece of wood half an inch thick, three inches wide, and extending from the buttock to the heel. Near the middle of this splint two bands of strong muslin, about four inches wide each, doubled on itself, and a yard long, are nailed at a distance of six inches apart. Two ordinary rollers, two small compresses, and some tow or soft flannel, complete the apparatus. Then whilst an assistant raises the limb, as in Dessault's plan, the surgeon applies an ordinary spiral bandage to cover in the whole leg and foot, and on reaching the knee brings the fragments as closely together as possible, and confines them by figure of 8 turns. He then covers in the thigh by the same sort of turns; places the splint properly padded on the back of the limb, and fastens it by spiral turns of the second roller. On coming to the lower one of the transverse bands he passes it above the upper fragment, over the compress placed there, and then draws the upper strap below the lower fragment, both being secured by a pin or knot, after which the remainder of the splint is covered in by the subsequent turns of the roller.

This apparatus is the same in principle as Boyer's, but has the advantage over it of being more simple, and easily obtained at a moment's notice; a shingle or strip of wood, a few tacks, and a piece of bandage, being all that is requisite; whilst it will be found to furnish a powerful means of approximating the fragments.

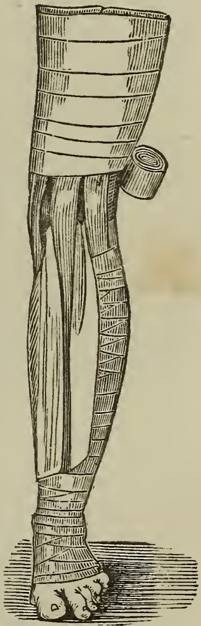
### MAYOR'S METHOD

Has been already mentioned under his system as the tarso-patellæ handkerchief.

### GERDY'S PLAN

Is similar to the uniting bandage for transverse wounds, and consists of two strips about half a yard long, one of which is cut into three tails, and the other into three slits, and used as follows: Place an ordinary spiral bandage on the front of the leg as far as the knee; then lay the tailed bandage so that its ends may correspond with the lower fragment, and fasten it to the leg by a second spiral, firmly applied. Place a spiral bandage on the thigh, and laying the slit bandage so that its slits may correspond with the upper fragment, bind it by another spiral bandage, or by turns of the first, also firmly to the thigh. Place the two compresses, one above the upper fragment, the other below the lower fragment, and passing the tails of one band through the slits of the other, press upon the compresses and force the fragments into apposition by fixing the lower, and bringing the upper one to it. Then confide the ends of the bands

*Fig.* 173.



to an assistant, and fasten them by another spiral of the lower extremity, beginning at the ankle and reaching to the groin, with figure of 8 turns at the knee over the whole (Fig. 173).

# CHAPTER VII.

## FRACTURES OF THE LEG AND FOOT.

### FRACTURES OF THE LEG.

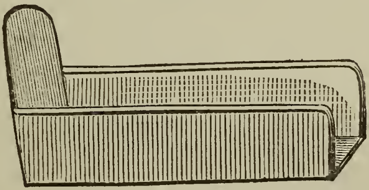
THESE whether of one or both bones, with the exception of the lower end of the fibula, are usually treated in the same way. Here, as in other fractures, various means have been proposed, but as the most simple one has in my experience seldom or ever failed in effecting a perfect cure, I shall describe it first.

The one to which I refer is sanctioned by the high authority of the Hospital, where fractures of the leg are extremely common, and where nothing else is employed except under very peculiar circumstances. Although the box is nothing new I shall name it, as applied in fractures of the leg, as the

### APPARATUS OF THE PENNSYLVANIA HOSPITAL.

It consists of an ordinary pillow, and a fracture-box. The fracture-box is made of four pieces of wood, the bottom one of which, extending from the knee to a little beyond the heel, has fastened to its lower end a perpendicular piece for the foot; whilst to its sides

*Fig.* 174.



are attached, by hinges, two lateral pieces about seven inches wide, which are intended to shut up against the sides of the limb and foot-board, so as to form the box, Fig. 174. Where hinges are not convenient strips of leather will answer equally as well. In applying it, place a pillow in the box, and the limb on the pillow; fasten the foot to the foot-board by a simple band over the instep; tie up the sides of the box, and the dressing is complete.

If it is desirable to apply cold washes in order to combat contusions, or to protect the pillow from discharges, in a case of compound fracture, a piece of oiled silk or coach curtain may be laid over the pillow. Otherwise it is not required.

This very simple apparatus is all that has been employed in this large hospital for the treatment of fractures of the leg during very many years, except where, from great lateral inclination in fracture of the lower end of the fibula, Dupuytren's splint was necessary. But this has seldom been the case; the tieing of of the foot to the foot-board, so as to give it an inclination inwards, and a little extra compression made at the internal malleolus by means of a pad of cotton, is all that is requisite, even in this often troublesome fracture. A very important point to be observed in the use of this apparatus, and one absolutely essential to its success, is the state of the heel, which being very apt to sink on the pillow, may thus cause the upper end of the lower fragment to project anteriorly. We must also see that the foot-board projects beyond the toes, in order to keep off the weight of the bed-clothes, and prevent their causing the same deformity by the extension of the foot. The band across the instep prevents the inclination of the foot to either side, and the pressure of the pillow against the limb by the sides of the box prevents lateral deviation of the fracture; whilst having the parts constantly before us we can remedy instantly any deviation, or combat inflammation, by cold washes, &c.

A simple rule by which to tell whether the bones of the leg are properly set or not, is to see that the edge of the first joint of the big toe corresponds with the inner edge of the patella. This, even if the patient is bandy-legged, will generally keep us right as to the proper position of the limb.

In cases of fracture of the leg, where the contusion is a slight one, but accompanied by a wound, attempts should be made to close it as soon as possible, and to promote its union by the first intention. To do this, draw the wound together with adhesive strips, and then apply over them a thick piece of patent lint, well wet with white of egg, so as to cause it to fit very closely to the limb, exclude the air, and form an artificial scab, as recommended by Sir A. Cooper. But since the introduction of Collodion nothing of this kind will be required, except in the event of the practitioner not being able to obtain it. Neither of the applications should be removed for several days. Should the wound, however, be a serious one, or proceeds to suppuration, no dressing will prove better than that of Dr. Barton.

### BARTON'S BRAN DRESSING.

This requires a fracture-box; some bran or fine sawdust, and a little cotton. Then fill the box, with its sides shut up (or have one made with fixed sides), one-third full of bran; place the limb in it, fasten the foot to the foot-board as before, and stuff some cotton between the knee and the sides of the box, to keep the bran from escaping. Then fill up the box with bran, so as to cover in the wound and whole limb.

This forms a very soft and equable bed for the limb, keeps the flies off from the wound, prevents the fœtor from the discharges, and owing to its absorbing the blood or discharge from the wound, swells and makes pressure on the part, thus tending to arrest the hemorrhage, or prevent the formation of sinuses. After two or three days, if we wish to change the dressing, scrape off the bran from the limb, and cleansing it from the wound by a spatula or syringe, re-apply it fresh. In hospitals this dressing is especially useful, as it preserves the wards from the fœtor of the discharges, which without it would sometimes be almost insupportable.

It also answers well for extensive wounds of the leg or thigh, the box, in the latter case, being made to extend up to the trochanter of the femur; and in some cases, to my knowledge, has tended to prevent erysipelas, by keeping the limb from the action of the atmosphere.

After the bony union in any case of fractured leg is tolerably firm, say after six weeks, an ordinary spiral bandage should be applied to the limb, and over this two splints of binder's board, or gutta percha, softened in hot water, should be confined by another bandage so as to mould themselves to the limb and strengthen the part, before the patient attempts to walk about.

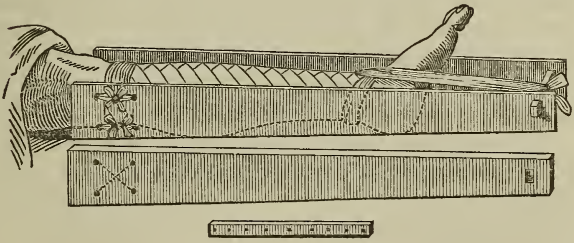
In very oblique fractures of both bones of the leg, extension and counter-extension is sometimes necessary to prevent shortening. To obviate this we may apply Physick's modification of Dessault's splints for fracture of the thigh, or Hutchinson's leg splints (though the first is preferable), till the tendency to spasm of the muscles has gone off, when the fracture-box may again be employed; but I repeat, that in my experience it is seldom any other dressing than the simple fracture-box has been required even in these cases.

## HUTCHINSON'S SPLINTS.

When, as just stated, the fracture is very oblique and especially if complicated with an attack of mania à potu, permanent extension may become necessary, and advantages result from the use of the following apparatus, suggested many years since by Dr. Hutchinson:

Two splints are to be made long enough to extend from the knee six or eight inches below the sole of the foot, with a mortise hole at the lower end of both splints, and four large gimlet holes at each of their upper extremities; after which a strip about twelve inches long, two wide, and one thick, should be fitted to the mortise, and so perforated as to receive a peg in order to prevent the splints from separating. Then placing the leg on a pillow, which has previously been covered by Scultet's bandage, let an assistant hold two pieces of tape eighteen inches long on each side of the knee, whilst the surgeon secures them by numerous circular turns of a roller, and placing the limb again on the pillow covers it with the bandage of strips from the ankle upwards. Let him now arrange the gaiter or extending band around the ankle, and tieing the tapes outside each splint by means of the four holes, draw upon the limb and tie the extending band to the cross strip, arranging the pegs so as to prevent the splints either from separating from each other, or pressing too closely on the limb. The cut shows very intelligibly the method of its application.

*Fig.* 175.



Should the leg swell very much from the pressure of the circular bandage at the knee, Dessault's long splint may be substituted, and the counter extension made at the pelvis instead of below the knee. The apparatus is not, however, applicable to fractures near the knee or ankle-joints, on account of the possible irritation of the extending and counter-extending bands.

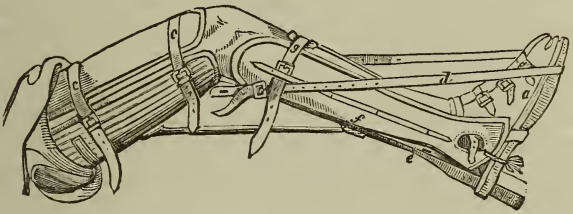
### AMESBURY'S APPARATUS FOR FRACTURES OF THE LEG

Is composed of a thigh-piece, properly shaped to receive the back of the thigh, having a pair of lateral splints connected with it, and some studs for the retention of straps ; a leg-piece, immovably connected to the thigh-piece at an angle, and hollowed out for the reception of the back of the leg; and a foot-piece, which admits of being so shifted as to adapt the leg-piece to the length of the leg. This should not rise higher than is sufficient to form a right angle with the leg-piece when connected with it. There are some holes in each side, and a strap is attached to it, having upon one end a buckle, and a shoe with a wooden sole, for the reception and retention of the foot, to which are attached two straps for connecting it with the foot-board. The foot-board is supported by a foot-strap, which, when in use, extends from one side of the thigh-piece round the lower part of the foot-board, where it is passed under a strip of leather placed there to keep it in its place, and then carried up to the opposite side of the thigh-piece, where it is buckled.

The apparatus to be used ought to be first adapted to the sound limb in cases of simple fracture of the leg, and well padded as in the case of fracture of the thigh before referred to; a small concave pad, too, should be placed on the inside heel of the shoe, and another pad upon the sole. Two side splints are required, the outer one extending from the foot-board to the upper part of the outer condyle of the femur, and the inner one from the foot-board to the inner condyle;—also a split deal shin-splint; and in cases of oblique fracture, a thin pad to be applied upon the instep, covered with a piece of pasteboard, a little wetted, which, when dry, serves to equalize the pressure and keep the instep easy.

*Application.*—In the first, or inflammatory stage, the shoe, *a*, containing the heel and sole-pads, ought to be carefully placed upon the foot; the instep pad arranged upon the instep, and the shoe closed over it, and firmly confined to the foot by means of the buckles and straps there attached for that purpose. An assistant should next be directed to place one hand under the knee, and, taking the foot in the other, raise the fractured limb, bringing it round so as to let it rest upon the heel. When the limb is raised the surgeon places the apparatus under it, and brings the angle of the same opposite the bend of the knee, directing the assistant to lower the limb upon the splint.

*Fig.* 176.



He now neatly fixes the shoe, *a*, to the foot-board, *b*, by means of the straps attached to the sole, and by its aid is easily enabled to raise or lower the foot according to the length of the heel or thickness of the calf, so as to bring the lower portion of the fractured bones into a proper line with the upper, as far as respects any angular projection backward or forward, and a padded splint being placed upon the front of the thigh, the whole of the thigh-part of the apparatus is fixed to the limb by means of the straps, *c*. That done, the shoe fixed to the foot-board and the thigh part of the apparatus to the thigh, the foot-board may be raised nearly to a right angle with the leg-piece, and fastened in this position by the foot-strap, *d*, care being taken that the heel does not bear against the sole of the shoe. The fractured ends should next be noticed, and if the foot requires to be raised or lowered, it may be done by means of the strap which confines the shoe to the foot-board.

The part of the pad, *e*, which lies under the small of the leg, being now raised and supported in close contact with it by means of tow or other soft material placed between the pad and this part of the apparatus, the whole length of the back of the leg will then have an equal bearing upon the apparatus.

The lateral splints are next to be applied, the longest upon the outer side of the leg, and the shortest upon its inner side, the lower ends of these splints being fastened to the foot-board by means of narrow tapes passed through the holes at the sides, and the upper end kept close to the leg by the circular strap, *g*, passed round the limb over the splints and the apparatus.

With respect to the position of the limb thus fixed, it should be placed with the apparatus resting upon the heel, and the two planes be well connected, as seen in Fig. 176, by means of the steel bar, which forms part of the apparatus for fractures of the thigh, the whole being steadied by tapes attached to the foot-board, and passing off from thence to the sides of the foot of the bed. Cooling lotions, leeches, &c., may be applied, by unbuckling the circular leg-strap and throwing back the side-splints.

When the inflammation is subdued, which is usually in three or four days, some strips of soap-plaster, each about an inch and a-half wide, should be applied round the limb with very moderate tightness, so that they may pass from the ankle to a considerable distance above the fracture. The ends should then be crossed on the sides or front of the leg, and cut off, so as to be easily turned back, when it is necessary to observe the state of the skin. Some strips, or a short roller, should also be passed round the foot to prevent œdematous swelling in that part. When this is done, and the side splints re-applied, the shin-splint should be properly adjusted, and the whole leg-part of the apparatus supported by three circular straps and buckles.

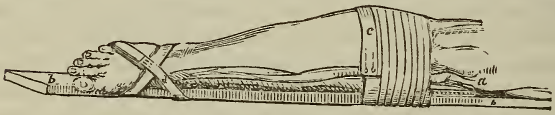
The cross-bar may now be removed, and the apparatus furnished with a sling or thong of leather fixed to the lower end of the leg-part of the splint, by means of which the limb may be moved passively at pleasure, the patient reclining upon a sofa, or resting his leg upon the seat of a chair. He may walk, too, with the assistance of crutches, passing in this case the sling over the neck, as in the ordinary way; the movements of the limb, however, should be always passive, and never by the action of its own muscles. In a fortnight or three weeks time, according to circumstances, the foot-board should be shifted a little higher up the leg-piece, so as to press the fractured ends together, and hasten their consolidation.

When both bones of the leg are broken, and the fracture of the tibia happens to be very oblique, extension must be made until the fibula is united. For this purpose, the thigh-piece of the apparatus can be pressed up closely against the back of the thigh, and the foot-board shifted down, so as to make the space between the foot-board and the thigh-piece longer than the leg. When the limb is placed on the splint, and the thigh-piece fixed, the assistant grasps the foot and ankle in his hands, and makes gentle extension in the natural line of the bone, so as to bring the fractured parts into proper adaptation; this being done, the surgeon keeps up the extension by buckling the strap, which is fixed transversely to the shoe, round the foot-board, taking care that the broken extremities unite in the relative position which they naturally occupy. For fuller details relating to this part of the treatment, the reader is referred to Mr. Amesbury's "Practical remarks on the Nature and Treatment of Fractures of the Trunk and Extremities," vol. ii.

### DUPUYTREN'S APPARATUS FOR FRACTURES OF THE LOWER EXTREMITY OF THE FIBULA

Consists of a wedged-shaped cushion, about two-thirds filled with bran or cotton, and of sufficient length to extend from the malleolus internus to the knee; of a strong splint about two feet long and three inches wide; and of two single-headed rollers from four to five yards long.

*Fig.* 177.



Then the fracture being reduced, the wedge-shaped cushion, with the base directed downward, is to be applied along the inner side of the leg. The splint is next to be applied on this, and made to extend about four inches beyond the sole of the foot, and both bound fast to the limb by the application of one of the rollers in the form of the ordinary spiral bandage, from just below the knee to a short distance, say one inch above the seat of fracture. Then with the remainder or with the other roller draw the foot in towards the splint, by figure of 8 turns of the instep and heel, maintaining it firmly in a state of permanent adduction. In Fig. 177 the turns of the upper roller do not come far enough down; they should extend to within an inch or two of the fracture, but never cover the fracture lest the pressure at that point counteract the effect of the splint.

### DESSAULT'S APPARATUS FOR FRACTURE OF THE OS CALCIS

Is made of a piece of a roller two inches wide, and of sufficient length to extend from four inches beyond the foot to the lower third of the thigh;—two single-headed rollers eight yards long and two and a-half inches wide; and a strong, well padded, pasteboard splint, moulded to the fore-part of the foot and leg, and reaching from the roots of the toes to a certain distance above the knee.

Then the foot and leg being held by an assistant, the first in the most complete extension, and the second demi-flexed, another assistant should be requested to support the thigh, laying hold of it at its middle third. The surgeon then proceeds to apply a padding of lint, or charpie, over the toes, and extends the strip of roller from the instep over the ends of the toes, well guarded along the sole of the foot, the back of the leg, and the lower and posterior part of the thigh, and the band being maintained thus by the assistants, the surgeon equalizes the posterior part of the ankle-joint by means of the padding, and applies the graduated compresses on each side of the tendo-Achillis. Next, taking one of the rollers, he fixes its initial end by a few circular turns around the ankle, which at the same time secures this portion of the band, and reflecting the remainder of the latter backward, covers in the whole of the foot. He now passes several figures of 8 about the heel, in order to embrace the separated portions of the bone and maintain them in apposition, and then carrying the roller to a short distance above the knee by a simple spiral bandage of the leg, reflects the upper part of the band downwards, so as to fix it by a few horizontal circulars just below the knee. In the last place, the padded splint is placed upon the fore-part of the limb, and confined by a second roller, carried from the roots of the toes to the middle third of thigh, and the limb is extended over a pillow, so as to form a double-inclined plane.

In fractures of the Metatarsal bones, or of the Toes, there is generally more occasion to combat the effects of injury to the soft parts than to set the fracture. We should, therefore, merely lay the limb in a fracture-box, and elevate it, to drain the blood from the part, applying cold washes, &c., to overcome the injury of the soft parts, and then keep it at rest against the foot-board. Caries is, however, very apt to follow such injuries even under apparently favourable circumstances.

FRACTURE-BRIDGES, ETC., are often spoken of, to keep the weight of the clothes off the foot, and special directions given for their construction, but nothing more is necessary than two halves of a common hoop tied together in the centre, as shown in the fracture of the thigh by Physick's plan.

# CHAPTER VIII.

## OF THE IMMOVABLE APPARATUS, OR STARCH BANDAGE.

Another method of treating fractures of the leg is by the now well-known method of Suetin, and Velpeau, or the "Appareil Immobile." In the use of this apparatus, attention must be paid to the nature of the case, the constitution of the patient, &c.; in other words, the surgeon must see that it is a favourable case of simple fracture, and without much contusion. It should also be recollected that the bandages used are to be those which have been previously shrunk, and that they must be *applied as in the French Spiral*, page 81, so as to leave the heel and toes open to inspection; and thus enable the surgeon to judge of the state of the parts above. In applying the bandages do it with a light hand, in order that they may not be too tight, and if the patient complains after their application, so as to show suffering, the *whole must be removed.* If thus applied, this dressing serves a most excellent purpose; but is liable to abuse and to the production of serious dangers without great attention on the part of the surgeon, not only in its application, as I have here directed, but also throughout its continuance. Indeed, several cases have resulted most unfortunately, even in the hands of distinguished surgeons; but with proper attention to the points italicised above, and the manner of applying it, the result will very generally be most gratifying. The success attendant on the cases in which I used it (and they were among the earliest in which it was tried in the

United States), may be best judged of from the following report of them as treated in the surgical wards of the Pennsylvania Hospital, in 1838, at which time I was the house surgeon:

### CASE FIRST.—*Fracture of both bones of the leg.*

George R——, æt. 34 years, a shoemaker by trade, and of temperate habits, was admitted into the Hospital, Dec, 25th, 1838, with an oblique fracture of the tibia at its lower third, and one of the fibula at its upper third, caused by a fall upon the ice. The limb at first was placed in the fracture-box, and evaporating lotions used to reduce the inflammation, which was considerable. On the third of January, seven days after the accident, the immovable apparatus was applied in the following manner: A *washed* roller, that is, one that had been well boiled and then dried, was smoothly applied from the toes to the knee, cotton being placed along the spine of the tibia, and also in the cavity on each side of the tendo-Achillis, to prevent excoriation from the turns of the bandage. This was then well rubbed on its outside with wheat starch, made thick and smooth by boiling for twenty minutes. A second roller was next applied from the knee down, and also well covered with starch. Two pieces of binder's board cut to fit the sides of the leg, and extend from below the knee to below the malleoli, were then soaked in water until soft, and being well saturated and rubbed with starch, applied to the leg over the bandages, so as to surround the limb, except for the breadth of a finger on the front and back; small cuts being made at the lower end, to cause it to fit the projection of the malleoli, and also at any other point where it bulged out. A third splint, made to fit the foot, and slit at the end so as to enable it to turn up behind the heel, was then applied to the foot and starched, and secured by a third roller from the toes up. This was coated in like manner; a fourth bandage applied over all, and the dressing completed by starch, which kept the whole smooth and tight, without the aid of pins.

The limb was now carefully laid in an empty fracture-box; a little cotton placed under the heel, and the foot tied to the foot-board, where it was allowed to remain for four days, at the expiration of which period the whole was dry and hard; the limb being cased as firmly as in plaster.

The patient was then kept in bed without any other dressing except the splints; and on the ninth of January, thirteen days after the injury, a bandage being doubled around his neck, carried down behind the calf of the leg, then in front of the ankle, over the instep, and round under the foot to the instep again, so as to form a sling and raise the foot a little from the ground, he was allowed to walk about with crutches. In this way he continued until February 7th, when the apparatus was taken off before the medical class in attendance on the practice of the house, and the limb found perfectly straight and firm, without the slightest deformity. On the 13th of February, seven weeks after the injury, the man was discharged. In this instance the apparatus was not touched until the fourth week, when a simple roller was applied to tighten it, owing to the looseness consequent on the shrinking of the muscles. One of the objections raised to the use of the apparatus was thus readily obviated without injury to the patient; for as the splints did not meet before and behind the leg, it was easy to fold the surplus bandage in, without causing any welt on the skin; while the bandages, having been previously washed, did not shrink to any extent.

### CASE SECOND.—*Fracture of the fibula two inches above the joint.*

Patrick D——, æt. 42 years, a labourer, fell off a step on the 15th of January, and fractured his fibula obliquely, two inches above the external malleolus. Owing to the inflammation, leeches, and the antiphlogistic course, with the use of the fracture-box, were continued until February 1st, seventeen days after the accident, when the apparatus was applied as in the preceding case, except that the splints were continued under the bottom of the foot; being slit up so that the fold under the foot did not interfere with the application of the splint to the sole; thus preventing all motion at the ankle-joint. After the apparatus had been dried in the fracture-box, with the foot well turned in, the patient was allowed to walk about, and on the tenth of February, twenty-six days after the accident, he walked up to the third story of the house, and was operated on by Dr. T. Harris for cataract. On February 21st, the apparatus was removed, there being not the least deformity perceptible even to the touch.

### CASE THIRD.—*Oblique fracture of both bones of the leg.*

Patrick C——, æt. 23 years, a labourer, whilst working on a railroad on the 18th of January, was knocked down, by the caving in of a bank of earth, and both bones of his leg broken obliquely, near the middle. He was treated in the usual way by the fracture-box, until the 27th of January, when the starch dressing was applied. January 31st, four days afterwards, was allowed to rise and walk by degrees, more and more each day, until February 25th, thirty-eight days after the accident; when the apparatus was removed. The limb was perfectly straight, firm, and strong enough to permit him to walk upon it. In this instance the apparatus was not touched until the sixth day after its application, when on his complaining of its tightness over the instep, the foot was soaked for a few minutes in hot water, and, by introducing a spatula under the bandage, it was raised sufficiently to free the point of pain. Being then allowed to harden, he suffered no inconvenience afterwards.

The next three cases were fractures of the thigh, in which, as there was but the one bone to act on, and other objects to be considered besides the mere support of the fractured ends, it was applied at a more advanced stage of the treatment.

### CASE FOURTH.—*Oblique fracture of the middle of the femur.*

Francis McG——, æt. 22 years, of good habits, fell, on the 23d of November, down the hatchway of a vessel, and fractured his clavicle and femur. The clavicle was dressed with the usual apparatus, and the femur treated by the long fracture-box, fastened on the double-inclined plane, until January 14th, fifty-three days after the injury; when the union not being firm, although there was considerable bony deposition, the apparatus was applied as follows:—A roller was carried smoothly from the toes up to the groin, the limb being held up and extended by assistants; this was starched as in the first case, and covered by a second roller. A long splint of binder's board was then applied, from the tuberosity of the ischium to below the knee, on the back part of the thigh, and another from the groin to the patella, in front, so as to surround the limb entirely, except for the space mentioned in the dressings of the leg. These were then covered in the same manner as the splints in the first case, and a simple roller applied from the toes up to the lower part of the knee, so that it could be renewed at pleasure. The limb was now laid on a simple-inclined plane, until the apparatus dried. Five days were necessary to dry it, when the man was allowed to walk about; the limb being supported by the sling before mentioned, and the splint behind preventing all flexion at the knee. On the 2d of February, about ten weeks after the accident, the apparatus was removed, without there being found any deformity or perceptible shortening in his gait; the measurement showing it to be but little more than a quarter of an inch less than the sound limb; and on the 7th of February the patient left the hospital.

### CASES FIFTH AND SIXTH.—*Oblique fractures of the upper third of the femur.*

Thomas H——, æt. 26, a labourer, fractured his thigh at its upper third, December 6th, about fifty miles from town. He was dressed in the neighbourhood, and did not arrive at the hospital till the third day after the accident, owing to the destruction of part of the railroad. The limb was much inflamed and swollen, and was treated at first by the inclined fracture-box, (Fig. 156), lotions, &c., until January 6th, when the starch apparatus was applied to it, and dried in the same manner as in the preceding case. On the 14th of January the man was allowed to walk about, and the apparatus remained untouched till its removal, February 12th, there being perfect union and only one-eighth of an inch shortening by close measurement, and none perceptible in his gait. On the 21st of February, eleven weeks after the injury, he was discharged.

The same apparatus was applied to Patrick E—— (who was admitted February 6th, with an oblique fracture, caused by blasting), on the 19th of February, thirteen days after the accident, and enabled him to sit up in bed five days afterwards, and on February 25th, to walk the length of the room. On his standing up, he felt too weak to walk readily, but had every prospect of doing so shortly. At the time he complained of no inconvenience from the dressing, and was able to turn about in his bed; the limb being but little shortened by measurement over the splints.

This case got well, but with marked deformity; so much so, as to make me resolve never again to apply this dressing to the thigh before there was partial consolidation of the fracture.

The advantages claimed for this apparatus are, that in the case of fractures of the leg it enables the patient to sit up, or move about, in fifteen days with perfect safety. But I have never deemed it expedient to apply it as early as M. Velpeau has done, owing to the severe contusions which complicated most of the fractures which entered the hospital at that time. With this restriction, however, it might, so far as is proved by the experience of these cases, be used in all simple fractures of the leg, as few will be found, in private practice, more severe than those on which it was tried.

In hospital practice it promises to be of great utility, by doing away the risk of sloughs on the sacrum, from the pressure consequent on the long confinement to the back; whilst it adds very materially to the patient's comfort by allowing him to rise to a window, or to go from one apartment to another. In case second, it enabled the man to rise and undergo an operation for cataract, in a place where the light was better than in his own room.

Since my residence in the Pennsylvania Hospital, I have frequently seen it employed by M. Velpeau, in his own wards, as well as by other distinguished

French surgeons, and do not hesitate, after twelve years observation, to repeat the assurance of its utility in such cases of fracture of the leg as have been mentioned.

But I doubt the propriety of its use in fractures of the femur, before there is considerable consolidation, not only from my personal experience, but also from a careful investigation of its results in European hospitals. To patients possessed of sufficient intelligence and prudence to understand the necessity of caution in moving about it will prove a great comfort, as I should not object to their sitting up with the limb supported, as soon as the apparatus had thoroughly hardened. In the case of a lawyer, with a fracture of both bones of the leg, to whom I applied it at the commencement of the third week, it afforded great relief, as he was enabled to sit at a table and write, as well as attend to his office business. Its success in any case will, however, depend on the proper application of the bandages; without skill in this operation the effects will, doubtless, prove unfortunate.

# PART FOURTH.

## CHAPTER I.

### OF THE APPARATUS FOR THE TREATMENT OF DISLOCATIONS.

#### GENERAL CONSIDERATIONS.

As dislocations, like all affections of the joints, involve very materially the usefulness of the limb, their proper treatment, and consequently the diagnosis of the accident, become a matter of equal importance with that of fractures. Indeed, as the structure concerned is much more complicated than that of the mere bony tissue, it is questionable whether the reputation of a practitioner is not more involved in these cases than in the previous class of accidents.

It would, however, be foreign to my present object to consider such injuries at length, and I can, therefore, do little more than hint at the principles involved, and the means required for their treatment.

Like fractures, these accidents are mainly dependent, for a successful termination, on the anatomical knowledge of the surgeon, though often requiring caution, and a high grade of professional skill, in consequence of the peculiar liability of the structure involved to take on inflammation, when instant resort must be had to means generally included under the province of medicine; in other words, they require the skill of a physician and surgeon combined.

Lined by a synovial membrane, strengthened by fibrous tissue, surrounded by muscles, and often attended by important nerves and bloodvessels, the effects of a high degree of inflammation in joints is nearly always destructive to the tissue concerned; so much so, that it is by no means uncommon for old unreduced dislocations to convert the parts around them into bone itself, thus completely modifying the action of the limb. This tendency should, therefore, be borne in mind by the practitioner.

But even in making an attempt at reduction there is something more than mere anatomical knowledge requisite to overcome the difficulty; because the distance between the origins and insertions of certain muscles being materially changed, it follows that some of them must be very much stretched, and others relaxed; and as this stretching results in spasm, relaxation of the spasm must be produced before there can be any chance of reduction. Here, also, the practitioner must combine medicine with surgery, till by means of bloodletting, antimonials, &c., the system is placed in such a state, that the use of mechanical means may enable other muscles to replace the bone in its proper situation.

Again, as a certain amount of muscular paralysis, laceration of ligaments, &c., often remains to a greater or less extent after the reduction, the use of counter-agents in the after-treatment is equally important; lest there be a recurrence of the accident.

These points, however, I can merely hint at, and must refer those desirous of a more thorough investigation of the pathology and diagnosis to larger works; merely giving here such points of practice as may serve the young practitioner for the moment.

# CHAPTER II.

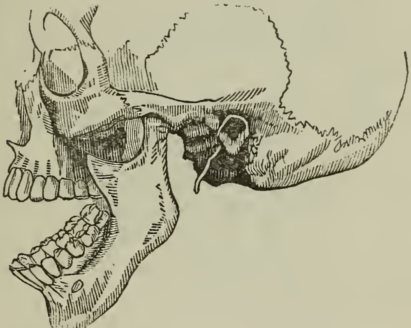
## ON DISLOCATIONS OF THE HEAD AND TRUNK.

The general principles involved in the treatment of this class of injuries being those just stated, I pass immediately to the consideration of the means required in the special cases.

### DISLOCATION OF THE LOWER JAW.

This, whether on one or both sides, requires that the condyle should be freed from the projections of the anterior portions of the glenoid cavity of the temporal bone, see Fig. 178.

*Fig.* 178.



*Reduction.*—To accomplish the reduction, seat the patient on a low chair, and let his head be supported against the breast of an assistant; whilst the surgeon, introducing his thumbs within the mouth, places them upon the molar teeth, and his fingers beneath the chin, so that he may depress the posterior portion of the jaw by the pressure of his thumbs, elevate the chin by that of his fingers, and by freeing the condyles from bony prominences enable the muscles to draw the bone into its place. But as they frequently do this with great violence, and are apt to pinch the fingers very severely, the surgeon should slip his thumbs off the teeth to the outside of the gums, as soon as he finds the jaw begin to yield to his movements; or wrap them well before introducing them into the mouth; or direct an assistant to place a fork-handle or plug of wood between the teeth of the patient, in order to save himself from injury.

*After-treatment.*—The after-treatment consists in the application of any of the bandages before referred to under the head of Fractures of the Jaw; in keeping the patient on soft food for several days after the reduction, and in directing him to avoid biting hard substances for some weeks subsequent to the accident, lest it again occur. Should inflammation of the joint supervene, it must be counteracted by the antiphlogistic treatment.

### DISLOCATIONS OF THE OBLIQUE PROCESSES OF THE VERTEBRÆ

Are so liable to produce death by pressing upon the spinal cord, especially in those of the neck, that it is better, as a general rule, to permit the deformity to exist, rather than endanger the life of the patient by attempting its reduction.

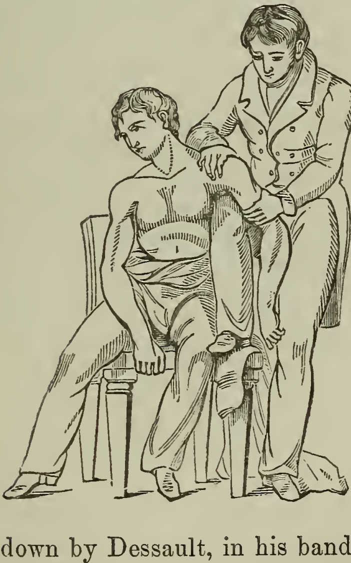
### DISLOCATIONS OF THE RIBS

Are said to occur at their posterior and anterior extremities, although many authors doubt the possibility of the first, without its being accompanied by fracture. In either case, the bandage directed for the treatment of fractures of the ribs will be as much as we can employ for their reduction; the compresses being placed over the dislocated extremity, in order more effectually to retain it in its natural position.

### DISLOCATIONS OF THE CLAVICLE

May occur either at its sternal or humeral extremity. The Sternal end may be dislocated, either forwards, backwards, or upwards; and requires that the shoulder should be carried in the opposite direction to that in which the sternal extremity rests, whilst the bone is at the same time drawn off from the sternum, by using the humerus as a lever, on the same principles as those laid down by Dessault, in his bandage for the reduction of a fracture of the bone.

*Fig.* 179.



*Reduction.*—The patient being seated a on low chair or stool, the surgeon should stand at his side, and placing his foot on the chair, with his knee in the axilla, bend the arm over his knee as a fulcrum with one hand, and with the other force the shoulder forwards, backwards, or upwards, according to the position of the dislocated sternal extremity (See Fig. 179).

*After-treatment.*—This consists in the use of Fox's sling, or the 2d and 3d roller of Dessault, for some two or three weeks.

### DISLOCATIONS OF THE HUMERAL EXTREMITY OF THE CLAVICLE

May be either above, or beneath the acromion process of the scapula, and is easily reduced when the shoulder is drawn outwards, by acting on the humerus as a lever. But though the reduction is easy the after-treatment will be found very difficult, in consequence of the small articulating faces concerned giving rise to a constant recurrence of the injury. The only means that I have found certain for the retention of the bone in its position, after the reduction, is the *Spica Bandage of the Shoulder* (Fig. 53), with a large compress directly over the acromion, and the use of a sling to the elbow, to keep up the head of the humerus.

# CHAPTER III.

## ON DISLOCATIONS OF THE UPPER EXTREMITY.

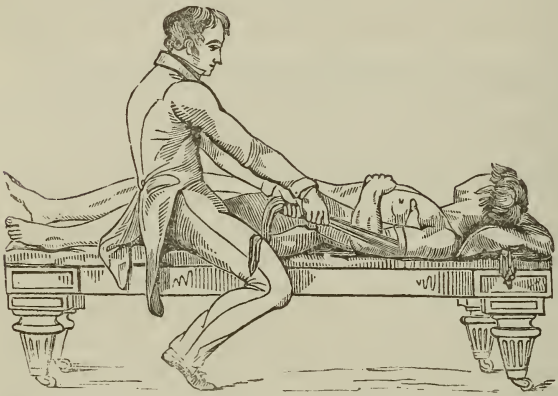
### DISLOCATIONS OF THE HEAD OF THE HUMERUS.

THESE usually occur in three directions; either into the axilla; under the pectoral muscle; or on the dorsum of the scapula; and require, as a general rule, the application of the extending force in the line that the limb naturally takes whilst dislocated. Thus, if the head of the bone is in the axilla, draw the arm in the line of the body; if under the pectoral muscle, off from the body; if on the dorsum scapulæ, across the chest; or elevate it so as to throw the head of the humerus into the axilla, and then draw parallel with the body. There is, however, some difference in the amount of force required, and the means of applying it, according as the case is recent or old, in a strong muscular patient, or in one of less power and more delicate frame.

*Reduction.*—The simplest means, and generally applicable only to cases of very recent occurrence, or of but slight muscular development, are those represented in Fig. 179, and just spoken of under dislocations of the clavicle. The cut explains itself.

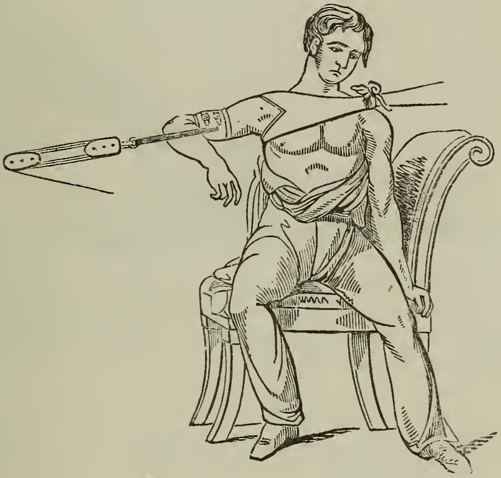
The next plan is, for the surgeon to place the heel of his foot (without his shoe) in the axilla of the patient, in order to make counter-extension, and then draw upon the arm by seizing the patient's wrist, or by grasping a towel fastened to the wrist or the lower end of the humerus, as represented in Fig. 180. If his own strength is not sufficient, assistants may lay hold of the towel, behind the hands of the surgeon, and assist the extension. But should the patient be muscular, a solution of tart. emet., or such other means as will induce faintness and muscular debility, will also probably be required.

*Fig.* 180.



In old luxations, or in well-developed subjects, even greater force than this may be necessary, such as the application of pullies to the humerus, and the use of more powerful means of making counter-extension on the scapula. Indeed, where pullies are at hand, the surgeon will often save himself much hard work, by employing them in the first instance. In order to use them, attach the towel or band to the lower portion of the humerus, by means of a clove-hitch (as shown hereafter), and fastening the hook of the pulley in the other end of the towel, place a sheet or padded strap around the scapula, as represented in Fig. 181. The extension may then be made either in the position exhibited in that cut, or with the patient lieing down, as in Fig. 180. In the application of these means of reduction much will depend upon the scapula being firmly fixed; and where the padded strap cannot be had, a narrow band should be applied to the acromion scapulæ, in addition to the sheet used to fix its lower portion. As the axillary vessels and nerves are apt to be acted on by the force employed to reduce the bone, their position and the possibility of their adhesion to the head of the humerus, especially in old dislocations, should always be borne in mind. (See Gibson's Surgery.)

*Fig.* 181.



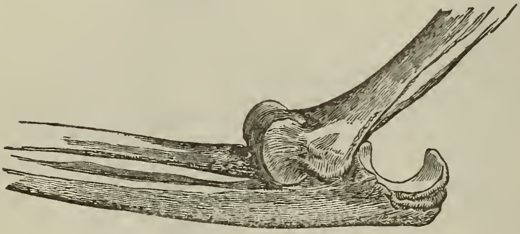
*After-treatment.*—Keep the head of the humerus perfectly at rest, by means of a sling, for three or four weeks, until the laceration of the capsular ligament has united, and combat the subsequent inflammation by leeches, &c., when required; cautioning the patient against elevating the arm for many weeks after the accident, lest he reproduce the injury.

### DISLOCATIONS OF THE FOREARM

May be divided into those of both bones, forwards or backwards, and into dislocations of the head of the radius alone.

As the first dislocation, viz., both bones forwards, requires the fracture of the olecranon, the treatment should be the same as that directed for this injury. In the dislocation of both bones backwards, the olecranon, resting on the posterior surface of the lower portion of the humerus (Fig. 182), requires that sufficient flexion be made to bring it down into the sigmoid cavity of the humerus, and free the head of the radius from the condyles.

*Fig.* 182.



*Reduction.*—To accomplish this, let an assistant make counter-extension by seizing the middle of the arm, whilst the surgeon makes extension at the wrist; or let him put his knee in the bend of the arm, and flex the forearm upon it; or bend it around a bed-post, or upon the hands of assistants.

*After-treatment.* — Apply a roller from the fingers up to the middle of the arm, and dress the limb with an angular splint, as directed for fractures of the condyles; making passive motion every three or four days, to guard against anchylosis.

### DISLOCATION OF THE HEAD OF THE RADIUS

May also be either forwards or backwards, producing either fixed pronation, or supination of the hand.

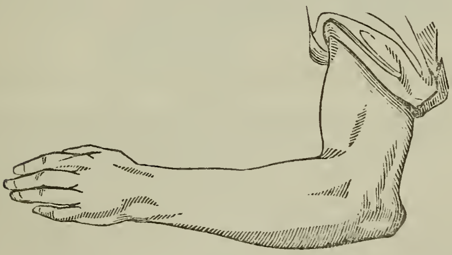
*Reduction.*—When dislocated *backwards*, as is most commonly the case, the hand being strongly pronated, should be raised by the surgeon and forcibly supinated with one hand, whilst with the other he presses the dislocated extremity from behind forwards, assisting this movement by slight flexion of the elbow. If extension and counter-extension are required, an assistant should make counter-extension by seizing the arm, whilst extension is made at the wrist by the surgeon, who also forces it into supination. If dislocated *forwards*, the manipulations of the surgeon are of course to be reversed.

*After-treatment.*—Place the arm in a sling, or on an angular splint, and keep it at rest; combating inflammation, and also any tendency to anchylosis.

### DIAGNOSIS OF INJURIES OF THE ELBOW.

Although the Elbow-joint is comparatively superficial, and the prominences of the different bones composing it sufficiently evident in its natural state, yet is it among the most difficult of the joints in which to diagnosticate an injury, in consequence of the swelling which so rapidly ensues. Fractures of the condyles of the humerus; fracture of the olecranon process of the ulna; dislocations of different kinds, and simple contusions, have all not unfrequently been thought by different surgeons to exist in the same

*Fig.* 183.



case. A simple rule, which I learned under Velpeau, and the accuracy of which I have frequently tested in the diagnosis of these injuries, is the following: Carry a string in a circle, round the elbow, from the external to the internal condyle, and when the forearm is semiflexed it will include the olecranon process and the two condyles, in the normal state; whilst the removal of either of these points out of the circle will show the displacement consequent upon the injury, as in Fig. 183, where, owing to dislocation of the forearm backwards, the olecranon is above the line referred to.

### DISLOCATIONS OF THE BONES OF THE FOREARM ON THE WRIST

Are usually reduced by the application of force to the front or back of the forearm, according to the dislocation. But as the laceration of the ligaments here involves a joint peculiarly liable to disease, perfect rest for several weeks, strict antiphlogistic remedies, &c., should be insisted on; particular attention being given to guard against anchylosis. The frequency of fracture of the lower end of the radius, and the liability to mistake it for a dislocation of this part, should also be borne in mind. (See Barton's Fracture of Lower End of Radius, p. 229.)

### DISLOCATIONS OF ALL THE BONES OF THE WRIST

Are seldom seen, except when complicated with such severe injuries of the soft parts as may require amputation of the limb. But the *Magnum* alone may be forced out of the cavity formed by the scaphoides and lunare, so as to project on the back of the joint.

*Reduction.*—Press firmly on the head of the magnum.

*After-treatment.*—Apply a compress over the bone, and bind the hand firmly to a splint applied on its palmar surface, extending it up to the arm, so as to keep the part at rest until the ligaments are united, or strengthened.

### DISLOCATIONS OF THE METACARPAL BONES

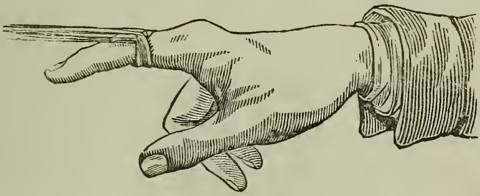
Are very seldom seen, except in that of the thumb; the treatment of which may be included in the consideration of

### DISLOCATIONS OF THE PHALANGES.

These may be either on the metacarpal bones, or on each other. I shall, however, take the dislocation of the first phalanx of the thumb, upon the metacarpal bone, as indicating the treatment of all these cases.

*Reduction.*—The phalanges being too short to enable any one to hold them firmly, the surgeon should first surround the bone with a piece of buckskin, and apply over this a piece of tape tied in a clove-hitch.

*Fig.* 184.



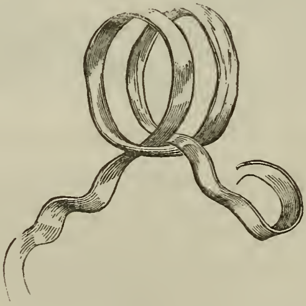
Then seizing the tape, make extension, pulling gradually downwards, so that the extremity of the phalanx may describe the arc of a circle, and thus free its upper portion from the projecting metacarpal bone; counter-extension being made by assistants at the wrist or forearm, if required. Should the difficulty of the reduction seem to be owing to the tension of the lateral ligaments, the internal one may be divided by introducing a narrow, sharp-pointed knife or needle, and dividing it by a sub-cutaneous incision.

*After-treatment.*—As in fractures of the phalanges.

### THE CLOVE-HITCH,

Just referred to, offers one of the most certain means with which I am acquainted, of applying an extending force to a limb, and is, I think, far preferable to the wet rollers, and other means of fastening the extending bands so commonly recommended. In dislocations of the humerus, or thigh, it will be found especially useful, and in my experience has never slipped when once properly applied. Though long recommended for the thumb, my attention was first called to its application to other parts, by a sailor in the Pennsylvania Hospital, in 1837, with a dislocated hip, who, seeing all the usual means of fastening the extending band slip and fail, just as the bone was nearly reduced, suggested that he should be allowed to tie the sheet himself, which he did in a clove-hitch, so that it held firmly and relieved him of his injury. Since that time I have employed it, and seen it employed, in numerous cases without its slipping; and

*Fig.* 185.



have always been pleased with the result. Sanctioned, as it now is, by Mr. Fergusson, it will probably supplant the miserable means of the towel and wet roller, and thus save a great expenditure of time and trouble.

To make it, practice with a piece of twine until the turns are learned, as follows:—Turn the string from right to left so as to form a circle, and bring one portion of the cord in front of the other, as in the right hand turn of Fig. 185. Then make a second turn of another portion of the twine, and twist it so as to place it behind the first turn, as in the left hand portion of the figure. On drawing the ends, the loops will be tied so tight, that the cord will break before the knot will slip. After learning these turns of the knot with twine, no difficulty will be experienced in making it with a sheet, or towel, in various other ways.

# CHAPTER IV.

## ON DISLOCATIONS OF THE LOWER EXTREMITY.

### DISLOCATIONS OF THE HIP-JOINT

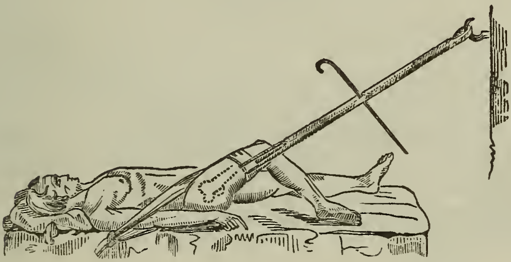
NEARLY always throw the head of the femur out of the acetabulum, into some unnatural position upon the innominatum. As the sides of the acetabulum project considerably above the surface of the ilium, it is requisite that, in addition to the usual extending and counter-extending bands, a lateral band should be applied on the inside of the thigh, near its upper third, in order to draw the femur off from the pelvis, and free the head of the bone from the acetabular prominences. This band has not been represented in the cuts, owing to the difficulty of doing so without confusing the drawings, in the works from which they have been copied; but its action is so simple that I think it cannot be misunderstood.

As the means employed for the reduction of the four different dislocations of this bone vary only in regard to the line of extension (which, it should be recollected, is generally to be made in the line which the dislocated bone naturally takes), I shall confine my description to the dislocation upwards on the dorsum of the ilium, as the most common. The pullies being required in most cases of dislocation of the femur, and as even with these the reduction is a matter of considerable difficulty, it will save much useless expenditure of strength on the part of the surgeon to apply them at once, without attempting other means. But where pullies cannot be obtained, the plan of Dr. Fahnestock, of Pittsburgh, reported by

Prof. Gilbert,[1] of using the power furnished by twisted rope, will be found to form an excellent substitute.

The mode of application is as follows: "Place the patient and adjust the extending and counter-extending bands, as for the pulleys; then procure an ordinary bed-cord, or wash-line, tie the ends together and again double it up on itself; then pass it through the extending tapes or towel, doubling the whole once more, and fasten the distal end, consisting of four loops of ropes, to a window-sill or staple, so that the ropes are drawn moderately tight; finally, pass a stick throughout the centre of the doubled rope, dividing the strands equally by it. Then revolving the stick as an axis or double lever, the power is produced exactly as it should be in such cases; namely, slowly, steadily, and continuously; which, with the aid furnished by the surgeon to the immediate seat of lesion, and to the system in general, cannot fail to conduct the case to a happy issue." The cut shows fully the manner of its application.

*Fig.* 186.



But when it is proposed to employ pullies, proceed as follows, to the

*Reduction.*—Fasten a roller-towel, or sheet, upon the lower end of the femur by a clove-hitch. Attach the pullies to the free ends of the towel, and fasten the hook of their opposite extremity to a staple, bar, or other fixed point. Place a sheet thickly folded in the perineum of the sound side, to make counter-extension; another across the pelvis from the ilium of the injured side, and a strong towel on the inside of the injured thigh, in order to draw the head of the femur off from the pelvis. Then, seeing that the bands are firmly fixed, and the patient's system relaxed by constitutional means, direct the assistants to pull slowly but steadily on the pullies, until the counter-extending band and the transverse pelvic band become quite tense and the muscles begin to yield to the power acting on them. Then the surgeon, seizing the leg by the ankle, should use it as a lever, to produce rotation of the head of the femur, and directing another assistant to draw strongly upon the towel which is on the inside of the thigh, continue the use of these different forces until the parts seem relaxed; when, ordering the extension to cease, suddenly the bone will be drawn into its socket. Should the muscle, however, not do so, a repetition of the same means will frequently succeed, although at first they failed.

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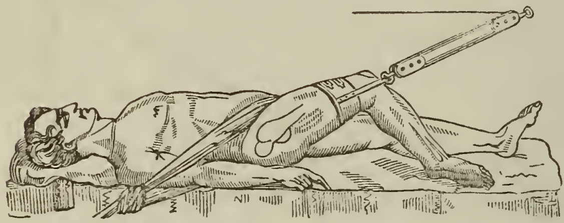
[1] Amer. Journal Med. Sciences, No. viii., April, 1845.

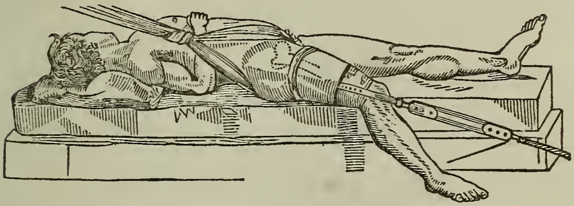
*Fig.* 187.



*After-treatment.*—Tie the thighs together, and keep them at perfect rest; combatting any inflammatory symptoms that may arise.

The line of direction of the extending force in the other dislocations of the femur will be evident from the following cuts:

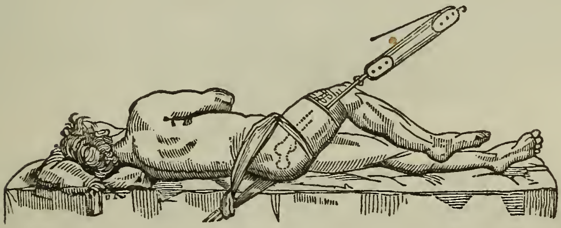
*Fig.* 188.



In the DISLOCATION ON THE PUBIS the limb is to be carried off from the body and placed as in Fig. 188, with the addition of the towel to the inside of the thigh.

In the DISLOCATION INTO THE SCIATIC NOTCH the limb should be carried in the opposite direction, that is, over the sound limb, and rotation practised by acting on the leg. The inside femoral towel is not required here, see Fig. 189.

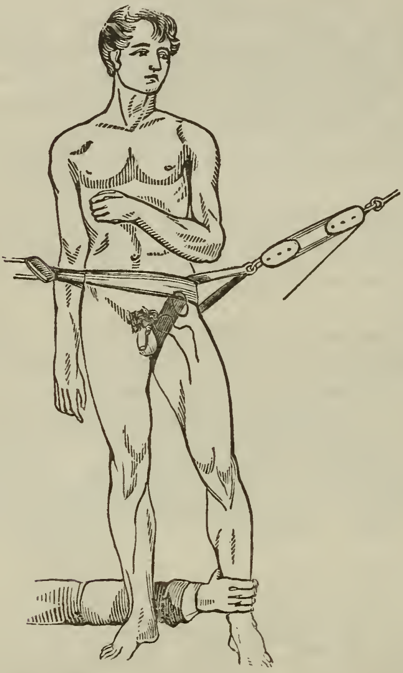
*Fig.* 189.



Various other means and modifications have been recommended for the reduction of these dislocations, but those just referred to will, I think, be found sufficient in most cases, whilst they have the sanction of some of the highest authorities in the profession.

In the DISLOCATION INTO THE FORAMEN THYROIDEUM the application of the extending force, as represented in Fig. 190, has advantages, in some cases, especially as directed by Sir. A. Cooper. The principle of its action may be seen at a glance, and is mainly useful in facilitating rotation of the head of the bone.

*Fig.* 190.



### DISLOCATION OF THE PATELLA

Can only occur laterally, unless there is also laceration of the quadratus femoris, or ligamentum patellæ.

*Reduction.*—In the lateral dislocation, the surgeon should place the heel of the patient on his shoulder, and pressing with his fingers on the edge of the patella, force it inwards or outwards, according to the character of the accident.

*After-treatment.*—Keep the limb extended for a few days, and direct the patient to wear a knee-cap or bandage (Fig. 91) for some weeks afterwards.

### DISLOCATIONS OF THE HEAD OF THE TIBIA

May occur in either of four directions; forwards, backwards, inwards, and outwards. In either case we should proceed as follows:

*Reduction.*—Extension being made by the hands of assistants at the lower part of the leg, and counter-extension at the inferior portion of the thigh, the surgeon should seize the condyles of the femur with one hand, and the head of the tibia with the other, and press them in opposite directions, as soon as he judges that sufficient extension has been made to enable the bones to take their natural position.

*After-treatment.*—Keep the limb extended, and combat the inflammation of the joint, which is usually very great. The use of a splint, bandages, &c., may be required for some time, in order to insure perfect rest and keep down inflammation.

### DISLOCATIONS OF THE FIBULA,

At either extremity, are so rare, except when accompanied by fracture, that I have little to say about them. When the luxation of the lower portion of this bone is accompanied with fracture of the tibia, it will require considerable skill to enable the surgeon to save the ankle-joint.

### DISLOCATIONS OF THE BONES OF THE TARSUS,

Like those of the carpus, are generally the result of such violence as implicates very seriously the soft parts, inducing such violent inflammation as requires the greatest care, to avoid the necessity of amputation. Their treatment, consequently, could not be properly considered here, and the reader is therefore referred for it to the books on Surgery.

### DISLOCATIONS OF THE METATARSAL BONES AND PHALANGES

Resemble very closely the same injury to the bones of the hand, and should be treated accordingly. See page 301.

But it must be recollected that if the joint of a toe remains unreduced, the pressure of the boot upon the projecting point will be liable to keep up a constant ulceration, and that this has sometimes been so troublesome as to induce the patient to submit to amputation rather than endure it.

# PART FIFTH.

## MINOR SURGICAL OPERATIONS.

THE diversity of opinion which exists in relation to the number and character of the operations which should be classed under the above head, renders the limits of this portion of the subject optional with those who may choose to classify them. I shall, therefore, in the subsequent pages, treat of such operative measures as every physician is liable to be called on to practice, and especially of those which fall to the lot of Residents of Hospitals and Junior Practitioners.

As a class, the Minor Operations are generally of the simpler kind, endangering the life of the patient only in consequence of the existence of some extraordinary circumstance; as surgeons also usually regard them of comparatively little importance, they may be correctly designated as minor operations, in comparison with those of a higher grade. But lest an incorrect estimate of their value be formed from their name, it should always be recollected that the term used is a comparative one. As preliminary measures, or as adjuvants to more important operative means, some of these operations possess an importance that cannot be overlooked; whilst a proper performance of them will often remove the necessity of resorting to more severe measures. In proportion, also, to the apparent simplicity of these duties is the professional injury likely to result to the practitioner who fails to execute them with success; and more than one surgeon of high operative skill has now to lament injuries produced by himself in the apparently simple operation of venesection.

# CHAPTER I.

## OF THE DUTIES OF ASSISTANTS IN OPERATIONS.

The number of Surgeons to be found in any district not embracing a city being generally limited, it follows that in most instances when one is called on to operate, he must look to his brother practitioners for assistance. Every physician should, therefore, if only from philanthropic motives, endeavour to qualify himself for the performance of such offices; and the duties of assistants, under these circumstances, may therefore justly be placed at the head of the Minor Operations.

To act as an Assistant to the greatest advantage, it is requisite that the general object of the operation, as well as the peculiar views of the operator, should be thoroughly understood previous to its commencement. Every medical man will, of course, possess a knowledge of the first; but if time, or want of practice, has impaired his recollection of the details of his surgical studies, he should never hesitate to request the operator to designate the steps of the operation, and also to specify particularly, any peculiarities that are likely to arise in its progress. The object of each operation being usually of a definite character, it is not easy to lay down such rules as will be invariably applicable; yet as there are many points in which all operations are alike, I shall endeavour to systematize the duties of assistants at all operations, and then to specify them in a few of those of most importance; believing that their observance will add to the comfort of all concerned.

1st. Every Assistant should endeavour so to identify himself with the operator, as to act solely under his will. This, of course, requires a full explanation on the part of the operator of his views, &c., previous to the operation.

2d. Each assistant should learn what are his own peculiar duties, and confine himself solely to them.

When each assistant is thus arranged there can be no confusion. Should an accident occur, the quiet of the assistants, and their attention to their own duties, until called on by the surgeon to do something else, will then aid very materially in combatting it: and if this sort of discipline was more generally observed at all operations, it would prove highly serviceable. When each man is at his post every duty can be well and quickly performed; whereas, when each one endeavours to do everything himself, all are apt to add to the confusion.

3d. Each assistant should, in every case, remember that the responsibility of the operation rests with *the operator alone*, even although the patient may have previously been under his special care.

4th. Every assistant should preserve silence, and never make a suggestion as to the operation after the first incision, unless directly inquired of by the operator. With a good surgeon such a rule would be useless; but occasionally the superior knowledge of an assistant may tempt him to violate it. In all operations with a good surgeon, every assistant will feel that he is a necessary part of the scene, the events of which, though calmly directed by the operator, could not be thus managed without his assistance; but with an ignorant one he is of yet greater consequence. Let the assistant, therefore, understand correctly the importance of his position under all circumstances, and endeavour to realize, that the success of every movement depends on proper individual effort. As the limbs to the head, so are assistants to the surgeon; remove either and the value of each is impaired.

In order to illustrate more directly the importance of the part often played by the assistant in operations, and the effect upon the operation itself, I would mention two, out of many of the cases that could be cited on the same point.

In the one, a distinguished French surgeon was extracting a cataract, and after lacerating the capsule of the lens, raised the flap of the cornea to permits its escape, when he received in his hand the whole contents of the eye-ball, solely because of the ignorance of his assistant as to his duty in holding the upper lid. In the other case, an operation for lithotomy was delayed many minutes after the perineum was cut, simply in consequence of the assistants not knowing how to hold the patients limbs; the operator being compelled to stop and show them how to do it. Not only the comfort, but also the safety of the patient, therefore, will often be found to rest on the observance of these or similar rules; and attention to them consequently becomes a matter of serious importance to all parties.

But in order to enable an assistant to act his part well, it is necessary that he should have more than general rules to guide him; and the consideration of his duties in a few special operations will not now be foreign to the subject. I shall, therefore, briefly detail the duties of assistants in some of the capital operations, even at the risk of trenching on operative surgery.

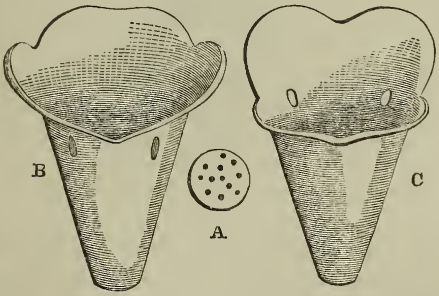
Before proceeding with any severe operation some means should be employed to mitigate its pain; and as public attention has now been given, for many months, to the use of Anæsthetics, a reference to them is necessary. In my opinion, their employment should be the first act of the assistants in every operation of a very painful character, except those connected with the mouth and throat. I am well aware that on this point there is some diversity of sentiment, and that some good old-fashioned surgeons, like the opponents of Jenner, have strong prejudices against their use. Having, however, employed them in a very large number of cases, and fully satisfied myself of their utility, I am perfectly willing to rely upon my own observations, and to recommend their administration to the reader of these pages as a measure which should be regarded by all as one of a high moral obligation, on the ground that the diminution of human suffering is the highest point of the surgeon's duty. At a very early period after its introduction to public notice, I administered Ether to the cases treated before the medical classes of the University of Pennsylvania, in the clinical lectures of that institution; and I have since continued to employ it, both publicly and privately, without having encountered any inconvenience of a serious character. Chloroform I soon found was a more dangerous article, and in one instance was compelled to resort to active measures to prevent a congestion of the brain. For this and other reasons I have long had doubts of its safety. But a mixture of chloroform and ether, in the proportion of one part of chloroform to four of ether, or one to three, as recommended by Professor W. Atlee of this city, has always proved in my hands a most pleasant agent. The stimulus of the ether, and the extreme sedation of the chloroform, seem in this compound to be happily counteracted, and it is this combination that I now exclusively employ. To the practitioner who has never administered Ether there is yet a portion of his education to complete; and as its effects when first given might induce him to mistake its true value, or an incorrect administration mislead him in its application, I shall describe the steps usually taken, and their results upon the economy, by condensing a portion of the excellent account of

Dr. Warren, of Boston.[1] To those who have not employed Anæsthetic agents, a reference to the treatise of this distinguished surgeon will furnish an amount of details, both as to their administration and physiological effects, that cannot but prove most useful.

The appearances presented by patients under the influence of ether have a general resemblance, varied, however, by the constitution of the patient and mode of application. The mode of application is very varied; a towel folded into the shape of a funnel, or a hollow piece of sponge, answer tolerably well, but cause a great waste of ether, by permitting its escape into the atmosphere. A tube of any kind containing a sponge answers better; such, for example, as the ordinary argand lamp chimney-glass, or a somewhat similar tube of tin, either being large enough to surround the lips.

A very simple apparatus that any tin-plater can manufacture, is one that I have had made for my own use. The shape will be readily understood by reference to Fig. 191. It is a conical tin tube, cut out so as to receive a portion of the chin and nose. Its

*Fig.* 191.



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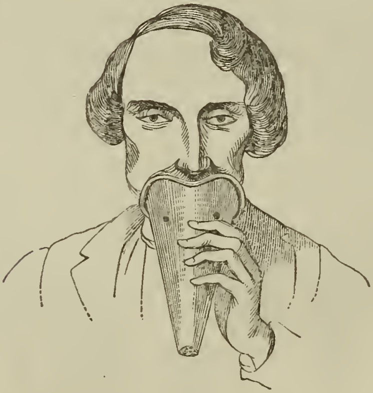
[1] Etherization, with Surgical Remarks, by John C. Warren, M.D. Boston, 1848.

greatest length, as adapted to an adult, is six and a-half inches; its transverse diameter, at a point corresponding with the two holes at C, is three and a-quarter inches: its antero-posterior diameter is three and a-half, and its apex, which is freely perforated to admit the air, is a circle of seven-eighths of an inch in diameter. The portion of the cut at B gives an anterior view from above, or of the part adapted to the jaw; that at C is a full posterior view of the tube as notched to receive the point of the nose. The two holes are to facilitate the escape of the breath of the patient, as well as to favour the inspiration of atmospheric air.

(Fig. 192) is a full front view of the instrument as applied to the mouth; the nose being left open or closed at the pleasure of the operator. Generally it is not necessary to close it, expiration being mainly performed through the nostril, and inspiration through the tube. Without claiming anything as especially meritorious, this instrument, from the facility of its manufacture, and the durable character of the

*Fig.* 192.



material, will be found of service. The sponge or towel, if used alone, is apt to irritate the lips by contact of the ether. The sponge being sunk in the tube avoids this, and also prevents a wasteful evaporation.

But before employing any instrument the patient should be shown how to inhale and expire through them, without ether, so that when the sponge is wet, it may not be to him an entirely new operation. The length of time during which inhalation may be continued, will vary with the peculiarity of the patient. With the mixture of ether and chloroform, as employed with a tube, I have placed some patients under its influence in two minutes; others in five; whilst others, especially if accustomed to the free use of spirituous liquors, have required twenty or more minutes. When a patient is once well etherized, the sponge containing the liquid should be removed entirely from the mouth, and re-applied for two or three minutes more, as consciousness returns. During tedious operations I have found eight or ten re-applications necessary, the patient recovering partially between each re-application; and generally being clamorous for more, if conscious of pain. The following effects of inhalation I condense from Dr. Warren's work:

"The first symptom is a short cough (or gasp), which impels the patient to remove the sponge or tube from his mouth; but no severe irritation being felt, he proceeds to inspire the vaporous draught more and more deeply until he becomes insensible. The respiration is then often audible, and sometimes even (almost) apoplectic; afterwards feeble and almost imperceptible; a state which, however accustomed to it, leads the surgeon to examine the pulse."

At this moment the patient lies as if dead, and may be cut in the most sensitive part of the body, without perceiving pain.

The pulse, says Dr. Warren, "being at first quickened from mental causes before the operation, is still more so a short time after the inhalation of ether, sometimes excessively so: subsequently it becomes slower, feebler, and even scarcely perceptible. When this is found to be the case the sponge should be removed, and the pulse will become more free. Then, if necessary, the inhalation may be resumed.

"The face, neck, and upper part of the chest, at first become red and flushed, but this soon gives place to paleness, succeeded by cold perspiration.

"Nausea or vomiting occasionally exist, or may be prolonged after the inhalation. This I have found very rare.

"The muscular system is often excited at an early period, the fists clenched, the muscles of the upper extremities and neck contracted; more commonly they perform various movements as if the patient were trying to extricate himself from the attendants. This is rarely seen in the lower extremities."

I have frequently seen surgeons who were unaccustomed to the appearances of etherization, alarmed at these muscular demonstrations, cease the inhalation, and regard its employment as worse than useless. A few minutes perseverance would, in most instances, have been followed by perfect repose.

"The conjunctiva of the eye is often injected with blood, the pupils generally contracted, sometimes dilated; in a powerful etherization, often fixed. The eyelids are occasionally open, more frequently closed; although the patient has the power to open them when called upon, if still conscious, thus affording a test which, though not universal, enables the operator to determine when to commence the operation."

When the assistant administering the ethereal mixture has brought the patient to this point, viz., apparent unconsciousness, inability to move the eyelids, and with a pulse beginning to act more slowly, he should invite the operator to proceed, and then keeping is finger on the patient's pulse, re-apply the tube as it increases in frequency, or consciousness returns; but not otherwise.

"The most curious changes are produced by etherization on the sensitive and intellectual functions, but are exceedingly various in their form and order. In many, tactile sensation appears to be suspended, while the intellect exists. The brain takes cognizance of external objects, while it either does not notice the impressions on the feeling nerves, or if it does, they do not produce the usual effect."

Many singular examples of this have been met with by all who have employed ether. A lady to whom I administered the chloric ether for the extraction of a large tooth, told me positively, when under its influence, that she was not at all affected by it; but judging from her pulse that she was, I requested the dentist to proceed, and he extracted the tooth in the midst of her remonstrances. In three minutes she was herself, and declared that though she felt the touch of the forceps, and the crush of the extraction, it caused her no pain. I once operated for hemorrhoids, on a lady, who quoted King Lear's soliloquy during the operation. A man with a bad fissure of the anus, which was so sensitive that the little finger could not be introduced into the rectum without almost creating a convulsion, had the parts freely exposed by a rectum speculum, and touched with anhydrous potassa. Though conscious of external events, he asked, on recovering his consciousness, when the operation would commence. But such cases are now too numerous to count.

The duration of the effects of ether vary. Insensibility may exist for five or ten minutes, but I have seldom produced a longer degree without repeating the etherization, not having believed it necessary. Nervous or hysterical symptoms occasionally supervene in the cases of females, but they usually pass off within fifteen or twenty minutes. In most of the cases that I have lately noticed, no unpleasant effects, of any severity, have lasted over a half hour, the nausea, hysterics, &c., formerly noticed, not having followed the application of the mixture that I have just referred to. With the pure ether I think they are more common. But, in every case, simple measures, such as fresh air taken into the lungs by a long inspiration, cold sponging of the face and head, a draught of cold water, or the use of smelling salts, have been all that was requisite, the patient frequently recovering, in every respect, in five or ten minutes, without resort to anything more than a glass of water.

With the safety of its administration thus shown, I again invite those desirous of a more detailed account of anæsthetics, to read Dr. Warren's little volume on Etherization, and urge them to try the effects of the chloric ether on a fit subject, before allowing prejudices and theoretical dangers, or exaggerated publications of fatal cases in journals and newspapers, to deter them from employing one of the greatest discoveries of modern times. The fatal cases from ether have been extremely doubtful, and were, even as reported, in its earlier administration. Chloroform, alone, is a dangerous article. But I can, with a full sense of responsibility, recommend the inhalation of about half a fluid ounce of the mixture of chloroform and ether, in the proportion of one part of the first to four of the second, employed in such an inhaler as will prevent its evaporation, and renewed until tactile sensibility is destroyed, as being as free from danger, in the hands of a scientific physician, as opium, or aconite, or hydrocyanic acid. Ether is certainly a powerful agent for good or evil; but in the hands of experienced practitioners it is, I believe, one of the greatest boons ever conferred on man.

The administration of the anæsthetic being the business of one assistant, the duties of the others must be regulated by individual operations. In order, therefore, to specify these duties more accurately, I shall refer to them, as required in the operation of

### AMPUTATION.

Amputation, when practised on the larger extremities, requires at least two professional assistants and two nurses or other attendants.

*The First Assistant* should apply the tourniquet, and watch its effect upon the hemorrhage during the incisions; holding the upper portion of the limb until the skin is divided. In the circular operation, he should then assist in the retraction of the skin; in the flap, favour the division of the flesh on each side of the bone. Then, when the surgeon is ready for the saw, apply the retractor, and protect the soft parts from injury, holding the upper portion of the limb steady whilst the bone is being divided. Next, removing the retractor, let him sponge the stump, tie the ligatures, or seize the vessels. Then dry the skin, favour the application of the dressing and the proper tightness and position of the tourniquet in case of hemorrhage, leaving it generally loosely applied to the limb, until all risk of secondary bleeding has passed.

*The Second Assistant* should hold the lower portion of the limb perfectly steady, in such a position as the surgeon may direct. He should be especially careful in this duty when the saw is applied, and especially not elevate the limb, as this will cause the saw to bind, nor depress it, lest he splinter the bone before it is entirely sawn through. After the section of the bone, he should place the amputated portion carefully and gently aside; not toss it on the floor, to the horror of the patient and his friends; the affection of a patient for a hand or foot being sometimes very great. After this, he may hand ligatures to the surgeon, or hold the tenaculum in the artery, or perhaps tie the bleeding vessel, or hand sponges, &c., and then assist in the dressing.

In many cases, besides the two principal assistants two or more others will prove useful; one may aid in keeping the patient quiet, encourage his spirits, give him drink, &c., whilst the other may wash and hand sponges, empty basins, obtain fresh water, &c., brandy, ammonia, and similar restoratives being provided by that assistant who may require to use them.

After this or any other operation, when the assistants are required to remove the patient to bed, or to change his position, they should recollect the directions given at page 239, on the treatment of fractures, with reference to this duty.

### LITHOTOMY.

As the lateral operation, for the removal of stone, is that which is most frequently performed in the United States, and as the gorget is the instrument resorted to by most surgeons, I shall limit myself to the operation, as performed under these circumstances.

The position of the patient should be on his back, with the palms of his hands embracing the soles of his feet; with the thighs widely abducted, but not so much so as to prevent the head of the femur acting perpendicularly on the acetabulum, as the pelvis is steadied by the direct pressure made on it through the femur.

Three assistants are in this operation very necessary, indeed I might almost say absolutely so.

*The First Assistant* should stand on the side of the patient, hold up the scrotum and testicles, and hold the staff, after the surgeon has arranged it in the bladder, and satisfied all parties of the presence of the stone. The importance of the proper performance of this latter part of his duty will, doubtless, be thoroughly explained to him by the operator, should he not be aware of it. The next point in his duty is to hold the staff perpendicularly to the belly, and with its convexity slightly inclined to the left side. I cannot, however, think that a surgeon familiar with the anatomy of the perineum, would wish the staff held otherwise than perfectly in the urethra, with the point well in the neck of the bladder, and without its pressing towards the rectum, or bulging on the perineum, or inclining markedly to the left side, as his anatomical skill, and not the staff, will furnish him with the knowledge of where he is to cut. But as surgeons differ on this point, the assistant should be guided in his course by the views of the operator. When the surgeon takes the gorget, the assistant should yield the staff to him and await the incision of the bladder, when again taking the staff he should withdraw it from the part.

*The Second and Third Assistants*, having precisely the same duties, may be referred to under one head. They should, after the surgeon has introduced the staff and proved the presence of the stone, pass the patient's wrists through the loops that must be made on the end of the bandage when prepared for this purpose, and make it hold firmly around the joint. Then placing the sole of each foot of the patient in the palm of each of his hands, let them by a series of figure of 8 turns bind the patient's hands and feet firmly together. Next, let each of the two assistants place himself so that the knee of the patient will come easily into his axilla; his hand and arm of that side being passed around the inside of the patient's leg and knee; his opposite hand grasping the patients ankle, and the back of his buttock being placed so as to press against the outside of the patient's thigh. Then recollecting that the patient's heel must rest on the edge of the table or bed, and that his pelvis is to be fixed against the table or bed by perpendicular pressure through the head of the femur, the assistants should separate the thighs to the proper distance, that is, until the perineum is made tense; hold the knee firmly in their axilla, and let the weight of each of their bodies be made to bear on the top and inside of the patient's knee; when he will be rendered perfectly secure. He cannot now extend his leg because his foot is tied fast to his hand; he cannot separate his thighs too widely because he is resisted by the back or side of the body of each assistant; he cannot close his knees without being strong enough to drag the two assistants towards each other; and he cannot raise his pelvis, because he is pinned down by the weight of each assistant acting on his knee and through his femur directly on his pelvis. But if the assistants do not place the patient's knees in their axilla, and bear the greater part of their weight upon them, or if they abduct the limbs so as to hold them in a lateral position to the pelvis instead of perpendicularly to it, the surgeon will be delayed in his operation, or the patient, by a sudden motion, may ruin himself for ever.

After the extraction of the stone, the second or third assistant may hand the syringe, barley-water, &c., if it is necessary to wash out the bladder, and then when all is completed, remove the bandages and free the patient's hands and feet; resorting to frictions if they find the circulation of these parts has been much obstructed by the bandages.

As in amputations, so in lithotomy, will other assistants be useful in restraining the patient's movements, furnishing drink, stimulants, sponges, water, &c.

In the operations for the Ligature of Arteries, Removal of Tumours, Resection of Bones, &c., similar general plans might be laid down. But as the above operations have illustrated the general duties to which

I referred, and may serve to furnish points to considerate assistants under all circumstances, I shall not treat of them in detail. The duties of assistants in arresting hemorrhage, &c., will be found under that head.

Every assistant should, as far as possible, acquaint himself with any operative or other peculiarities possessed by the surgeon, and endeavour to act accordingly; and both the operator and the assistants should most distinctly understand that they are to confine themselves strictly to their proper sphere. If a surgeon after arranging his assistants chooses to try and do everything himself, or if each assistant in his anxiety to aid the operator tries to furnish him with whatever he wants, they will all soon find the operation proceeding in glorious confusion. Let the rule of every operation always be, "a place for every one, and every one in his place."

# CHAPTER II.

## OF BLOODLETTING.

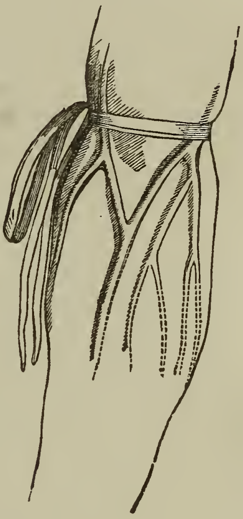
By this term is understood the use of any means intended to take blood from the body, with the view of preventing disease. These operations may, therefore, be divided into several kinds, according as they are practised upon the superficial veins by means of lancets, leeches, cups, &c., or upon the arteries. When the extraction of blood is made by a single opening cut in one of the veins, it takes the name of Phlebotomy, or General Bloodletting; when from an artery, that of Arteriotomy; and when done by the aid of leeches, or cups, it is especially designated as Local Bleeding. First—

### OF PHLEBOTOMY, OR VENESECTION.

This operation may be practised upon the veins of various parts of the body, as at the bend of the arm, the back of the hand, the leg, or neck; though the first is by far the most common. At the bend of the arm we find generally five veins, arranged so as to form a figure not unlike the letter M. These veins are, the Cephalic, Basilic, Median, Median Cephalic, and Median Basilic, a slight reference to the surgical anatomy of each of which must precede the steps of the operation.

The skin in front of the bend of the arm being smooth, soft, and thin, these veins are generally seen bulging through it, or indicated by dark blue prominences. When not thus seen naturally, they may be rendered more apparent by a ligature applied above the elbow, as in (Fig. 193) or they may be known by their elastic feel, and by their swelling under the finger, when friction of the forearm has caused the blood to accumulate within them. Underneath the skin we have the adipose tissue, which varies considerably in its amount, but is never wholly wanting. As the superficial veins, or those opened in venesection, lie between this adipose tissue and the fascia covering the muscles, the amount of fat necessarily affects very materially the facility of operating, because the veins, being deeply placed, are more liable to escape the puncture of the lancet. Beneath the fascia, yet only at the depth of two lines, or thereabouts, lies the brachial artery, or sometimes the radial or ulnar, according to the point of division of the brachial into the latter. Of the five veins before referred to, the Cephalic is on the outside; the Basilic on the inside; the Median in front of the arm; and the Median Cephalic, and Basilic, run from the middle to either side, to join the main trunks. The External Cutaneous and the Internal Cutaneous Nerves are those mainly liable to injury; but their position varies so frequently that I cannot pretend even to refer to them, as it would be inadmissible in a description which is only intended for an outline; it being expected that in this, as in other operations, the anatomy of the part will be

*Fig.* 193.



learned before any one would commence operating.

As the great variety existing in the arrangement of the vessels of the arm renders it, also, almost impossible to designate every spot where some unexpected accident, especially the wound of a nerve, may not occur, I can only point out, in general terms, the best mode of operating, and then refer to the accidents likely to arise from the operation, with the means of cure.

The easiest vein to bleed in at the bend of the arm, on account of its size and fulness, is the Median Basilic, but it is at the same time more dangerous than the median cephalic, on account of the position of the artery. The latter may, however, generally be felt pulsating, and by opening the vein by a slightly horizontal cut, or by moderately flexing the arm, especially if the operator is cautious in his movements, there is but little risk of injury to this vessel. Some bleeders recommend turning the hand into strong pronation, because it assists in preventing accidents, either by throwing the muscles more over the artery on the cephalic side, or relaxing the fascia, and making it more difficult to cut, on the basilic side; and I believe it to be a good practice, the risk of wounding the tendon of the biceps being not worthy of consideration, as compared with the safety of the artery.

The varying position, however, of both arteries and nerves, render it difficult to foretell their injury, and the general rule in bleeding, therefore, is to take the vein that is fullest, provided the artery is not too near, and leave the nerves to chance. In several hundred cases, I have never met with the slightest accident; whilst others, who were probably equally, if not better informed than myself, have experienced considerable inconvenience. In thin subjects, owing to the deficiency of adipose tissue, the veins are nearer the skin, but being also looser are more liable to roll under the lancet; whilst in fat persons, though more firm and less moveable, they are less readily seen. The depth of the incision must, therefore, be regulated by the obesity of the patient. It will also be found advantageous for the operator to accustom himself to bleed by the touch rather than the sight, and to practice his fingers on deep-seated veins, or those in fat arms, until he can distinguish the elastic feeling of a vein from the tenseness of a tendon, or the pulsating cord of an artery. With a view of softening the skin, and rendering the touch more delicate, some bleeders moisten the finger in the mouth before searching for the vein. It is, however, a filthy practice, and one that is of little assistance; if the finger of the operator is not sufficiently delicate in its touch let him soak it in warm water, but not spit on it. The risks of the operation will be treated of hereafter.

Previous to bleeding at the bend of the arm, a simple circular bandage, or a ligature, should be placed with moderate firmness just above the elbow, so as to arrest the circulation in the veins. This ligature must not, however, be so tight as to arrest the circulation in the arteries, and to judge of this, the operator, after tightening the ligature, should feel the pulse. After a certain amount of friction to fill the veins, the forearm should be either held in an extended position by an assistant, or placed between the chest and the bend of the operator's arm; or in his axilla; or the patient may rest his hand on the top of a stick. The operator should then endeavour to feel beneath the vein, by making firm pressure on it, for the position of the artery, and if he finds the vessel pulsating, should open the vein selected, by a more horizontal cut than is usual, or choose another vein, or change the relative position of the vein and artery by strongly pronating the hand, as before stated. He should then place the thumb or fingers of his left hand on the vein, below the point at which it is to be opened, in order to steady it. Then holding the lancet in his right hand, and facing the patient, if he is bleeding in the right arm, or in the right hand, with his back to the patient, if in the left arm, let him cut through the integuments, and open the anterior parietes of the vein; *still pressing on the vein*, *below the opening*, *with his left hand.* The basin or cup to hold the blood being previously placed, and the clothes around protected by a sheet, he should then remove his finger from off the vein, and immediately the blood will fly into the bowl. This pressure with the fingers of the left hand, below the orifice, will be found to be a neater plan than that usually pursued, of allowing the blood to escape immediately on opening the vein, as it protects the clothes or bed from the blood.

The LANCETS with which bleeding may be practised are of two kinds, viz., the Spring and the Thumb Lancet; either being used according to the views of the operator or the wishes of the patient.

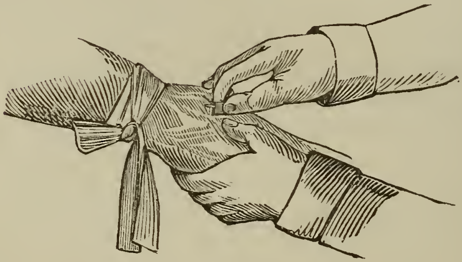
The SPRING LANCET is an old German instrument, of some 300 years date, and consists of a metallic case on the outside of which is a trigger, whose point is inserted under a spring, when the instrument is set. Below the spring, on the inside, is placed the fleam or blade, which is drawn up to the spring previous to operating. Occasionally, another and smaller spring is placed on the inside, under the fleam, in order to keep the latter constantly in contact with the spring moved by the trigger; but it is an unnecessary addition, and in fact does harm, as it weakens the driving force of the lancet by opposing the descent of the fleam.

The Thumb Lancet, also of very ancient origin, is made of a simple piece of steel fastened between two handles, and intended to be pushed into the vein by the hand of the operator. Three kinds are employed, viz., the barley-corn or obtuse-pointed; the spear or oat-pointed; and the serpent-tongued; although the last is now nearly obsolete.

Considerable diversity of opinion exists in the United States, both in the minds of patients and operators, as to the advantages of these instruments, and the prejudices of some are so strong against the Spring Lancet as to prevent its use, and vice versâ. In some parts of Europe, as in England, France, &c., and in the eastern and northern portions of the United States, the thumb-lancet is preferred; whilst in other portions, as in the southern, middle, and western portions of our country, the spring is almost entirely used. The use of the Thumb Lancet is thought by some to require less skill, and therefore to be better suited to general use; but as far as my experience goes, the spring is attended by the least pain to the patient, and danger to surrounding parts. I have known sea-captains, supercargoes, sailors, nurses, and others, who have used the Spring Lancet without any accident, who yet were perfectly ignorant of the difference between a vein and an artery; consequently, I regard this objection as void; whilst very many, from too great boldness and force, will inevitably transfix the artery with a Thumb Lancet, having no idea of the depth to which they should go. In skilful hands, the Thumb Lancet is probably the most surgical instrument; but it gives the patient much more pain, the vein is more apt to roll from under it, and the opening is often not sufficiently free to prevent thrombus. For these reasons I infinitely prefer the Spring Lancet, as I can bleed with it more horizontally in cases where the artery is near the vein; give the patient no time to shrink before its puncture; cause him little or no pain; regulate very accurately the depth to which I would go, by regulating the height of the fleam above the vessel, and as yet have never seen a vein transfixed by it, the resistance of the integuments and of the vessel generally overcoming somewhat the force of the spring. Even in young children I have invariably used the Spring Lancet, and although I have operated on those as young as eighteen months, have never had any difficulty from the operation. Nevertheless, every bleeder should be able to employ either instrument, so as to yield to the prejudices of a patient, and thus avoid drawing upon his own head the reproaches that might ensue upon the occurrence of an accident, under different circumstances.

If the Spring Lancet is preferred, it should be held between the forefinger and thumb of one hand, with its blade obliquely to the circumference and axis of the vein selected; so that, on the trigger or button being touched by the finger, the blade may be driven into the vein, obliquely to its axis and also a little on its side: being then less likely to wound subjacent parts.

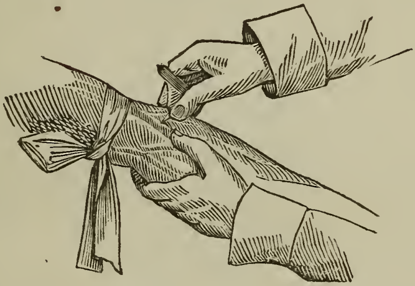
*Fig.* 194.



If, however, the Thumb Lancet is the one used, the operator should proceed as follows; bend the blade to a right angle with the handle, and place it in the mouth, with the point of the blade turned from the hand that is to take it, lest when, after completing the preliminaries, his hand is raised to his mouth to seize the instrument, he should injure himself by sticking its point into his own hand.

In using this lancet, seize the blade between the thumb and forefinger of the hand that is preferred, and rest the third finger of the same hand on the arm, as a point of support. Then placing the point of the lancet on the vein that it is wished to open, push it suddenly inwards, upwards, and outwards; depressing the handle in a circle, so as to make a free incision in the line before spoken of. With either instrument, after having drawn the amount of blood that is desired, undo the ligature above the elbow, seize the skin about the opening between the the thumb and fingers, so as to close the wound, and wiping the arm clean, place a small compress over the opening, and confine it by adhesive strips or by a figure of 8 bandage of the elbow, as before shown. The operation being now completed, particular attention should be paid to the cleansing of the lancet, in order to prevent difficulty at the next call for its

*Fig.* 195.



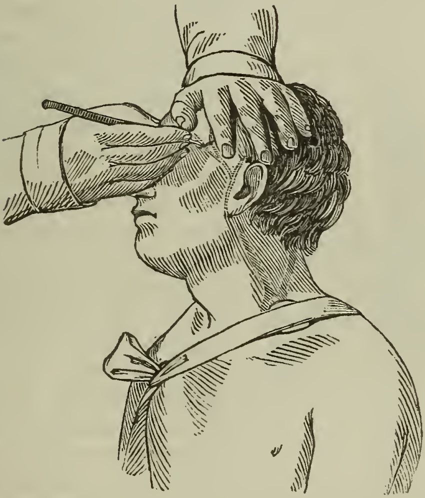
use, as a dirty lancet frequently causes abscesses of the part, gives rise to phlebitis, and otherwise endangers the life of the patient. If the opening in the skin and that in the vein do not correspond, a bloody tumour, called a *Thrombus*, will be formed. This consists in the escape of the blood into the cellular tissue beneath the integuments. As it forms slowly; sometimes attains the size of a small egg and has occasionally a pulsation, in consequence of the superficial position of the artery, young bleeders are apt to view it as a most serious matter, and expect to find an aneurism, or other serious difficulty. It is in reality a very simple matter, being little more than a large blood blister. Its treatment is consequently also very simple, and consists in enlarging the orginal opening in the skin, or in making pressure on the swelling, or in simply leaving it to be absorbed by nature, assisted by moderate pressure.

In BLEEDING IN THE HAND the only rule to be observed is, to open with a Thumb Lancet that vein which is most easily seen. This is generally the Vena Salvatella, or the Cephalic of the Thumb, avoiding the tendons, and guarding against a deep puncture, for fear of injury to the parts beneath.

BLEEDING IN THE EXTERNAL JUGULAR VEIN is now seldom practised, because the other veins generally furnish a sufficient amount of blood, or because it is less cleanly than venesection in the arm, or on account of the danger of the introduction of air into the vein. In cases, however, of great cerebral congestion, as in apoplexy, or in infantile convulsions, it is occasionally practised, and I think may be resorted to with advantage. When deemed necessary it should be done as follows:—

Place a thick, graduated compress on the base of the vein just above the clavicle, and fix it by a narrow cravat, the ends of which should tie in the opposite axilla, Fig. 196; or else apply an oblique bandage of the neck and axilla, as before shown: or, compress the vein with the thumb, though by this plan there is more danger of the entrance of air into the vein, from the compression being more imperfect. If the vein does not become apparent from this compression, direct the patient to move his jaws as in mastication, and it will soon fill. When filled, open it with a Thumb Lancet, at its lower third, and place a bent card, or other substance likely to form a little trough, just below the opening, so as to carry the blood off to the receiver, and thus prevent its trickling down the patient's side. Having taken the amount desired, close the orifice, as in the arm, by pressure of the thumb and forefinger, and fasten a

*Fig.* 196.

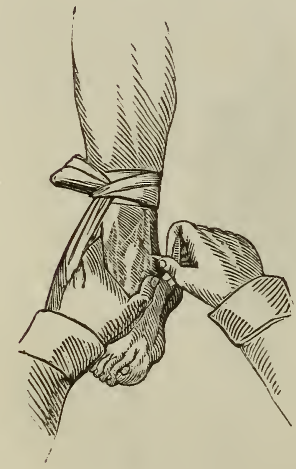


little compress over it by adhesive strips, before removing the bandage below the vein, as this will ensure the non-entrance of air to the vein, an event which is very apt to prove almost instantly fatal.

Bleeding at the Ankle is generally performed in the Internal Saphena vein just above the malleolus, where it is very superficial; though it is also occasionally practised in the foot itself, or in the external saphena vein.

*Operation.*—In order to bleed in the veins of the leg or foot, the operator will require a ligature, &c., as in the other cases, and also a bucket of warm water, in which to plunge the foot previous to the operation. Then, the patient being seated, the limb is to be placed in the hot water as high as the calf, in order to assist in filling the vein and render it more apparent. After some minutes it should be removed; the ligature applied about four or six inches above the malleolus, and the heel placed upon the point of the operator's knee, or on a low stool. A thumb lancet being previously held in the mouth, and the vein, steadied by pressure with the fingers, is then to be taken in that hand which is most convenient, and the vein opened, by a wound (Fig. 197) which should be rather longer than the one made in the arm, in order to give a free discharge to the blood, which here seldom escapes in a stream; it being

*Fig.* 197.



more commonly necessary to replace the limb in the warm water, in order to facilitate its flow, than to see it escape in a jet. The wound should not, however, be allowed to sink into the water, but remain just above it, whilst the amount of blood taken must be judged of by the discoloration of the liquid. When satisfied as to the proper quantity, it only remains to remove the ligature, wipe the limb, and confine a compress over the opening by the figure of 8 bandage of the ankle.

The only accident likely to result from bleeding at this point is, the wounding of the saphena nerve: the arteries being distant. Should the nerve be wounded, either in this or any of the other operations, it will be shown by pain, by twitchings, tingling, &c. To treat this injury it is usually necessary to apply a warm poultice; keep the limb at perfect rest for a couple of weeks, and use the antiphlogistic system generally.

Bleeding in any of the veins may be followed by irritation of the edges of the wound; by abscess, or by erysipelas. Any of these accidents will be best combated in the first stage, by resorting to the poultice and other measures just referred to, and by such subsequent treatment as the knowledge of each practitioner will readily indicate.

From want of proper attention in the selection of the vein, or from want of skill on the part of the operator, it occasionally happens that an artery is opened. This serious accident may be readily told by the brighter red colour of the blood; by its escaping in jets which are synchronous with the pulsations of the heart; by the blood continuing to flow, notwithstanding firm compression of the vein below the opening; or by noticing the change in the colour of the blood produced by a very firm compression of the artery alone, above the wound. When thus satisfied of the nature of the accident, the operator should endeavour to guard against his suspicions of it being seen by those around, in order to prevent alarm; and if the state of the health of the patient does not absolutely forbid it, let the blood flow till fainting is induced, when he may arrest it by a firmer compression than is requisite when the vein alone is opened. To do this, make, by means of several small graduated compresses, or by a thick pyramidal compress, a cone, the point of which shall rest upon the wounded vessel; fasten it by a firm figure of 8 bandage of the elbow, and apply the Spiral of the Upper Extremity, from the fingers up to the upper part of the limb. This treatment should then be continued for fifteen days or more, by which time the closure of the opening in the artery will generally be effected, though most probably an operation for aneurism will be required. Velpeau and others have, however, seen cases in which the wound in the artery closed, without there having been at any time sufficient compression to stop the pulsation at the wrist. Let it, however, be remembered, that proper attention will enable an operator to avoid this serious accident, and that when it happens, it will generally be his own fault.

Besides the veins above mentioned, bleeding was formerly practised in many others, as the occipital, auricular, frontal, sub-lingual, dorsalis-penis, &c., but the introduction of leeching has done away with these operations. Where, however, leeches cannot be had, and it is desirable to take blood directly from the part, these veins may be opened by operating as in other veins, it being borne in mind that such operations should always be performed with a Thumb Lancet, the orifices in the external veins being afterwards closed by a compress, adhesive strips, &c.; and that in the sublingual, and others, by the application of cold, or salt and water, or astringents.

### ARTERIOTOMY.

This operation, which was practised to some extent by the surgeons of the sixteenth, seventeenth, and eighteenth centuries, and highly thought of by Hippocrates, Galen, and Celsus, has been almost entirely abandoned by those of the present time, no one now ever thinking of bleeding in the radial artery, or opening the lingual, or those of the mastoid region, and very few of opening the temporal. Should this, however, be deemed proper, and should there be no other way of drawing blood from the part to be benefited by the operation, the smaller arteries should be selected, as the anterior branch of the temporal, and not the main trunk.

*Operation.*—The patient being seated, with the head supported, or else lieing down, feel for the pulsation of the vessel, about fifteen lines in advance of, and above, the meatus auditorius externus, where the artery is almost without the temporal fascia, close under the skin, and well supported by bone. Then, with a lancet or bistoury, cut the vessel in half transversely, either by cutting from the skin inwards, or, what is better, from within outwards, as seen in Fig. 196, the instrument being previously introduced below the vessel. The artery should never be, as a general rule, opened longitudinally, because the contraction of its muscular coat would tend to close the orifice, and stop the hemorrhage. As soon as the vessel is opened, the blood flies in a jet, and may be either received directly into a basin, or else drawn off by a bent card or trough, as in the operation on the jugular vein. Should the bleeding tend to stop, before blood enough is taken, we should apply warm clothes to the part, wash out the clot, &c.; but if enough has been taken, then compress the vessel below the puncture; close the wound; apply a compress, and fasten it either by a simple circular bandage of the vault of the cranium, or by the knotted bandage, shown before. I cannot but think, that except in very urgent cases, this operation, at the present day, can ever be necessary, safer means accomplishing the same purpose and avoiding the subsequent formation of aneurism, or the scar from the tieing of the vessel, which are often disagreeable and troublesome.

## LOCAL BLOODLETTING.

The name of Local Bleeding is generally given to the operation in which the smaller vessels, and those close to the diseased part, are opened. It may be practised by means of Leeches, Cups, or Scarifications.

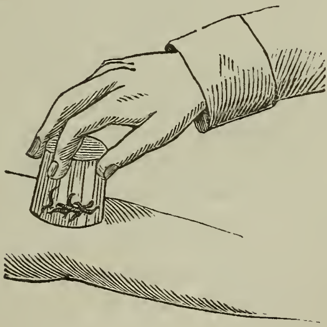
### LEECHING.

The Leech is an animal of the inter-vertebrated articulated family, Annelidæ, and has been employed in medicine from almost time immemorial. This species, *Hirudo Medicinalis*, is an aquatic worm, with a compressed body, tapering towards each end and terminating in circular flattened disks; the hinder one being the larger of the two. It swims with an undulating motion, and moves when out of the water by means of these disks or suckers: fastening itself first by one, and then by the other, and alternately stretching out and contracting its body. The mouth is placed in the centre of the anterior disk, and is furnished with three cartilaginous, lens-shaped jaws, lined at their edges with fine, sharp teeth, which meet so as to make a triangular incision in the flesh. It varies from two to three or four inches in length, and inhabits most of the marshes and running streams of Europe, and many parts of the United States.

Leeches afford the most effectual means of abstracting blood locally, being often applicable to parts which, from their situation or great tenderness, would not admit of the use of cups, and, in the case of infants, are always preferable to the latter.

In order to apply them with ease to any part, care should be taken to free it, by washing, from all medicaments, and by shaving from all the hair or down on the skin. If the leech is very active or hungry, it will readily attach itself to the part when thus cleansed: but generally it is necessary to moisten the surface with a little blood, or with milk, or with sugar and water, when the leech will readily leave the vessel containing it, and attach itself to the skin. If it is desirable to attach a leech to any one point, place it in a large quill or glass tube, and put this directly on the part; when, as the animal cannot escape, it will readily adhere. But when the part is not so circumscribed, it suffices to apply the edge of the cup containing them just below the point, and let them crawl on to it; or place them under a tumbler, and by confining their wandering, cause them to attach themselves to the portion beneath the glass (Fig. 198).

*Fig.* 198.



Where blood is wanted to induce them to bite, it may be readily obtained by tieing a string tightly round the extremity of the finger, so as to render it turgid, and then lightly pricking it with a lancet; the blood escapes in points, and may then be smeared on the part. This operation causes no pain, unless very often repeated on the same finger. But if a part is thoroughly cleansed from all secretions, hairs, &c., and care is taken in the preservation of the leech, it will attach itself without necessitating this operation.

Leeches continue to draw blood until they are gorged, when they drop off. But if it becomes necessary to remove them before they are thus filled, it should be done by washing them with a little salt and water, and not by pulling them off; as this is very apt to leave the teeth in the wound, where it serves as an irritant, besides being destructive to the leech. Six American leeches are calculated to draw one ounce of blood; but as their bites frequently bleed as much as the animal itself drew, this is but an approximation to the quantity. Some persons are in the habit of cutting off the tail of the leech, in order to cause it to continue sucking for a long time, as the blood passes out as fast as swallowed; but it is a barbarous practice, and of course destructive to the utility of the animal. After the leech has come away, the bites continue to bleed, and this may often be encouraged by the application of flannels, and cloths wrung out of hot water. But if it is not desirable to take this extra amount of blood, cover their bites with a piece of linen, moistened in sweet oil, or spread with fresh lard or cerate. Occasionally it happens, in the case of children or weakly individuals, that the after-bleeding is profuse and debilitating, and that it is absolutely necessary to arrest it at once. Various measures have, therefore, been recommended, but I have generally found, under these circumstances, that it is only necessary to touch each bite with a sharp-pointed piece of lunar caustic, or to dry the spot thoroughly, and then apply over it a small piece of patent lint or cotton, wet with collodion. A hot needle, stitches, &c., have been recommended, but the above is less painful, and more readily applied. In our large cities, where leeching is the peculiar business of a class of individuals, there is generally no difficulty in their employment; but with the country practitioner it is different, as he must preserve and apply them himself, and this is found to be a very onerous duty. Let it, however, be recollected, that their application is sometimes a matter of absolute necessity; that, as above shown, it is simple, and two of the objections to their use are removed. Their preservation is then the only point of difficulty, and this may be obviated by a slight attention to the habits of the animal. The leech, when gorged, remains inactive or unfit for use for several weeks, and is also liable to disease, by which numbers are lost. All that is necessary to guard against this, is perfect rest in a vessel of fresh water; in a few weeks they will again be fit for use. The preservation of them by the following rules is easy, and always ensures a supply: Never squeeze them to cause them to disgorge, it brings on disease. Place them in clean water, and change it frequently. Then, in order to keep them in health and ready for use, place them in a cool place, and arrange a mixture of moss, turf, and fragments of wood at the bottom of the vessel containing them, laying a few stones on the pieces to keep them in position. Place in it, also, a piece of wood or earthenware filled with small holes, so that the leech may keep up its natural habits, and by drawing itself through the holes in the board or through the moss, sticks, or stones, free itself from the secretion of slime found on its body, which otherwise becomes the cause of disease. By changing the water occasionally, and keeping the trough, tub, or jar, covered with a piece of muslin, in a cellar, any practitioner can always have a supply of these useful animals at his command. Let it be recollected, however, that those which have been used are to be kept separate from the others for about two months, when they may be replaced in the trough till again called for. If, in applying leeches to any point of the body whence they might escape to internal parts, as about the anus, the mouth, &c., they should remain in these parts, they may be at once destroyed and ejected, by the free use of salt and water, either as an emetic or enema. But the fear of any internal injury from them is groundless, as the heat and other peculiarities of the parts will at once destroy them.

### MECHANICAL LEECHES.

A substitute for the leech has recently been suggested by Mr. Alexander, of Paris, and named as above. They consist of small glass tubes with bevelled ends, the air within each one being exhausted by a very ingenious and simple mechanism. Applied to the surface of the body they act like small cups, and produce congestion of the superficial vessels. Then a small metallic tube, containing a three-bladed or triangular lancet, makes a puncture of the skin; after which, the glass leech is re-applied as often as may be necessary, precisely as in the ordinary operation of cupping.

In several instances in which I have employed these leeches they acted well, and satisfied me that to the country practitioner, under ordinary circumstances, they would prove very useful, although I do not think they can supplant the aquatic leech, especially in the abstraction of blood from small regions, as the eyelids, gums, nostrils, rectum, &c. Being put up in boxes containing a dozen or more, and sold at a moderate price, they will, however, claim the attention of all practitioners who are so situated as not to be able to obtain or apply the natural leech. As agencies for the sale of the Mechanical Leech now exist in both Philadelphia and New York, the druggists can readily furnish them. Printed directions accompany each case, and render their mechanism perfectly intelligible.

## CUPPING.

By the word Cup, is understood a little bell-glass, three to four inches high, from which we exhaust the air, so that when applied on the skin it may cause a congestion of this membrane, from the pressure of the atmosphere upon the parts around the cup itself. These cups, though made of various materials, yet differ chiefly in the manner in which the air within them is exhausted; some being slightly open at the top, and fitted to receive the end of a small air-pump; others being entirely closed, and exhausted by the use of fire, applied internally in different ways. Whenever the cup is simply applied on a part, it causes a flow of blood and temporary fulness of the vessels in the skin; but when the flesh is cut after this application of the cup, the blood will flow freely from the incisions, on the exhausted cup being again placed over the part, though it could not do so previously. This mode of depletion is termed Cupping, or the application of wet cups, in contra-distinction to dry cupping, or that in which the cup is applied merely to draw the blood to the surface. When it is desirable to exhaust a cup, it may be done either with the pump, by fitting it to the cup as prepared for it, applying the latter to the part perpendicularly, and then working the piston once or twice as in any ordinary syringe: or by the use of fire to rarify the air within the cup itself.

With the latter view, various means have been employed; thus the air may be rarified either by the rapid insertion of a candle or little torch, followed by the instant application of the cup to the part; or else fire may be placed in the cup and it at once put on the skin. To do this, some practitioners shake a little alcohol around the inside of the cup, pour out what flows readily, and inflame the little that adheres to the glass by a lighted piece of paper; others introduce small balls of inflamed cotton saturated with alcohol; others simply use pieces of burning paper; but the two last cause unnecessary pain, by burning the skin on which they fall. The best and neatest way of exhausting a cup, is the following: Cut several pieces of letter-paper, slightly glazed, into strips about one inch and a-half wide. Wrap this round the end of the fore-finger, so that about one-third of its width shall project beyond the end of the finger, and having thus formed a little tube, tear off the remainder of the strip, and twist the part projecting beyond the finger, so as to close up the tube, and form a little cap like a thimble. Dip the open end of this thimble lightly into alcohol; a small portion will adhere to its glazed surface; touch it in a candle; throw it into the glass, and apply the latter at once to the part. The shape of the thimble is such that it will nearly always fall on its apex, or twisted end, whilst the part wet with the alcohol, or the base, will stand uppermost and sufficiently far from the skin to prevent its being burnt. Having by either of these modes exhausted a cup, allow it to remain on the surface of the part till the skin under it has become turgid, then, if blood is to be taken, cut the integuments by means of the Scarificator, and re-apply the cup as before; removing it when filled or half filled with blood, and again applying it, if necessary. In order to remove the cup, introduce the nail of the fore-finger under its edge, and gently force the cup on to its side, so as to allow the air to enter. After wet cupping, the parts should be cleansed, and covered with cerate or an oiled rag.

If the regular cupping apparatus, as furnished by the cutler, is not at hand, we may perform the operation very well by using wine-glasses or tumblers; scarifying the parts, if blood is to be taken, by rapid punctures of a thumb-lancet, bistoury, or sharp penknife.

In using the Scarificator, the operator should regulate the depth of the lancets, previous to its application, and then place it firmly in contact with the skin before touching the spring, so as to avoid the lacerated incision which will probably otherwise result from the cut of the lancet, if loosely applied.

# CHAPTER III.

## OF CUTANEOUS IRRITATION.

Another useful method of producing depletion is by means of irritation, as excited by various means in the cutaneous exhalents; or by the establishment of serous and suppurative discharges.

These temporary inflammations are usually created on the surface of the body, with the view of relieving some internal disorder that is more dangerous to the life of the patient than the one thus excited, and when properly directed, are possessed of great power. Acting on the principle of revulsion, they relieve internal inflammation, by drawing the fluids to the surface, and operate with as much certainty as any of the usual means of bloodletting; whilst they are, also, applicable to cases where the latter means would not be generally available, as in the chronic phlegmasiæ, &c.

To explain fully their modus operandi, or enter more in detail into the cases for their application, would lead to the consideration of points foreign to my present arrangement, and I can, therefore, treat only of their production; and first

### OF BLISTERS.

The simplest drain that can be created on the surface of the body, is that arising from vesication or the formation of a Blister. This Blister generally creates only sufficient inflammation to cause an effusion of serum under the cuticle, by which the epidermis is separated from the subjacent strūcture, and forms a cyst. Various substances may be resorted to for the accomplishment of this end.

The most common is the Ceratum Cantharidis of the United States Pharmacopeia, which is spread on kid, brown paper, or other substance; applied directly to the skin, and left there for about five hours. Then on applying a poultice, vesication is readily effected without creating strangury or other general inconvenience. Various other preparations are also recommended as possessing peculiar advantages, as Brown's Cantharidine Tissue, which act promptly, and with some advantages over the old blister plaster. But one of the neatest means that I have employed is the solution of Cantharidine in Collodion, called the Vesicating or Cantharidal Collodion. This should be painted on the skin as in the ordinary use of the liquid adhesive plaster referred to at page 49.

If a prompt blister is required, the application of a piece of oiled silk over the collodion will cause vesication in about three hours. But if the cantharidal collodion is simply painted on the part, and allowed to evaporate, it will require rather longer. The advantages of the preparation will be found in its easy application, in its fixedness, and in its certainty. When blisters are required on the temples, back of the ears, neck, and other perpendicular surfaces, it will recommend itself by its permanent adhesion (see Journal of Pharmacy, Oct., 1849). As soon as vesication occurs, the elevation of the cuticle arrests the further action of the collodion. Whenever vesication is established, and the serum excited by a blister has created a cyst, it should be punctured, and the slight ulcer left by removal of the cuticle, will usually heal kindly under the use of simple dressings, without much discharge. But if it be desirable to make a more permanent impression, and continue the drain, instead of merely evacuating the fluid first secreted, we should seize the cuticle with a pair of forceps; and either cut or tear it from the inflamed surface; then dress the excoriated portion with some stimulating ointment, as that of savine; of cantharides; of mezereon; or with cabbage, or beet leaves; or with any of the other stimulating ointments of the Pharmacopœia. By these means, a permanent blister, as it is termed, may be kept up for six or eight weeks, though usually the discharge is continued with difficulty after this lapse of time. In such cases, the following plan will increase the flow and create an issue on the blistered surface: Take two or more peas, made of orris root, and bind them firmly to the part, through an opening made in the cerate covering the rest of the sore. Continue the pressure until they ulcerate into the true skin, when, by the use of any of the previous ointments, a discharge may be kept up for any period that may be desired.

A blister, however, is not often employed in this manner, as issues can be more readily created, and with less pain to the patient, by the means hereafter mentioned.

When it is desirable to raise a blister in a very few minutes, as in cases of collapse, concussion of the brain, &c., the fly-blister commonly employed will not answer, as it is too slow in its operation. Resort must then be had to something more active, such as compresses wrung out of scalding water and applied directly to the part, taking care to prevent the escape of the liquid over surrounding parts. Or, a piece of thin soft paper saturated with spirits of turpentine, or alcohol, may be pressed firmly on the body, set fire to, and allowed to burn for a few seconds. This raises a blister with great rapidity, but is extremely painful to the patient if consciousness is at all perfect. A plan recommended by Sir Anthony Carlisle, was to lay a double folded piece of moistened linen upon the portion to be blistered, and pass over this a flat cautery iron heated to a reddish-brown heat.

A neater plan than either of these, and less painful, will be found in the use of Granville's strong rubefacient lotion, or pure Aqua Ammonia, applied directly to the spot by means of patent lint, or pieces of linen saturated with it. This powerful remedy requires but a minute or two to raise a blister, if the ammonia is pure; but, like the hot water, requires caution, to prevent its flowing over surrounding parts. The best means of accomplishing this is to pack lint in a pill-box until it projects above the rim, and then press it against the skin: the edges of the box circumscribing the action of the lotion. Gondret's ointment consisting of strong aqua ammonia, lard, and suet, will also vesicate speedily, if covered with a compress; without the use of the latter it generally acts only as a rubefacient. As the ointments before mentioned tend to increase the effect of a blister, and augment the discharge after its production, so a mild soft poultice, of any warm emollient substance, will generally diminish its action, when the inflammation runs too high.

## ISSUES

Are drains that are most generally created by the action of some substance, which, by destroying the tissue, induces a discharge in consequence of the efforts of nature to repair the damage. Two classes of agents possess this power: 1st, Chemical Agents or Caustics, as commonly designated, and 2d, Heat, or the actual or potential cautery. Each of these agents, by destroying the organization of the skin, creates a dead mass called an Eschar. This, being thrown off by nature, leaves a cavity, which being filled with issue peas, or some irritating substance, keep it open and continue the discharge.

Chemical Agents, or Caustics, are those most commonly employed. They may be used in three forms, solid, liquid, and as paste. Of the solid kinds, we have the Potassa, or Kali Purum; the Nitrate of

Silver; the Bi-Chloride of Antimony; the Chloride of Zinc, &c.; all of which act in the same manner. The caustic potash being readily obtained, and prompt in its effects, is the one most generally preferred.

In using this article, select such a spot for its application as will not involve any deep-seated important parts. Thus, superficial joints, arteries, nerves, bones, &c., should be avoided, less the action of the caustic extend to them, and produce serious injury. Issues should, therefore, be established in the fleshy part of the arm, or thigh, or on the back of the neck, or along the spine. If we choose the thigh, the depression which exists on its inner side, just above the knee, will be found convenient; if the arm (and this is most common), take the space between the biceps and the deltoid, near the insertion of the latter. Then laying upon the spot selected a piece of adhesive plaster, or kid spread with soap cerate, with a hole in its centre of the size desired for the issue (generally about three lines in diameter), rub the integuments within this hole with a piece of the caustic potassa till they become black, and repeat the operation each day, if necessary, until an eschar is obtained of the desired depth. This usually should not be deeper than the integuments, lest it extend beneath the fascia, and produce subsequent trouble. Or we may place in the opening of the plaster a piece of potassa, about the size of a hemp-seed; cover this with a strip of adhesive plaster, and apply over it a compress and bandage. After twelve hours, on removing the plaster, apply a warm poultice, in order to hasten the separation of the slough, which on coming away will leave a deep circular ulcer. This ulcer should then be filled with three or four peas made of Orris Root or Gentian, which, by absorbing the moisture, will swell and distend the part. Should they, however, not prove sufficiently irritating, dress the sore with Basilicon, Mezereon, or some other stimulating ointment.

The daily dressing, subsequently used, must depend upon circumstances. If fungous granulations arise, they must be repressed by the nitrate of silver; suppuration kept up by moving the peas, and by the ointments just stated; and too much inflammation prevented by the use of warm poultices and mild cerates. The removal of the peas, and the use of simple dressings, generally suffices to heal the sores.

In order to protect the ulcer from accidental injuries, and also to keep the patient's clothes from being soiled by the discharge, it is usual to cover the part with a small plate of tin, or some other light metal, moulded to its shape, and fastened by an elastic band so as to surround the limb. These little bandages are generally kept by the cutlers or druggists, and add much to the patient's comfort.

When, in the production of an issue, any apprehension exists of the action of the caustic extending too deep, we may neutralize it by an appropriate article. Thus, washing the part with vinegar will neutralize the action of caustic potash; salt and water that of the nitrate of silver; magnesia, or some other alkali, that of sulphuric acid, &c.

The formation of issues by incision has so little to recommend it, that I shall pass it by.

When other means cannot be had, iron heated in the fire may be substituted for the caustics just mentioned. Heated to a white heat, and applied directly to the skin, the actual cautery immediately produces an eschar, which follows the same course as that created by caustic. The fears of patients, and the greater convenience of other means, have, however, thrown this mode of creating an issue out of general use.

The Sulphuric, Nitric, and Hydrochloric Acids, are occasionally employed, when some objections exist to the means just stated. In order to use them, steep a small compress of patent lint, fixed to the end of a small piece of wood, in the liquid, and apply it directly to the skin, guarding against the extension of the acid over surrounding parts; the eschar will then be made as before stated. In cauterizing the bites of rabid animals, the liquid caustics are preferable to the others, as they spread more rapidly; but the wound should in these cases always be enlarged, previous to their use.

## OF SETONS.

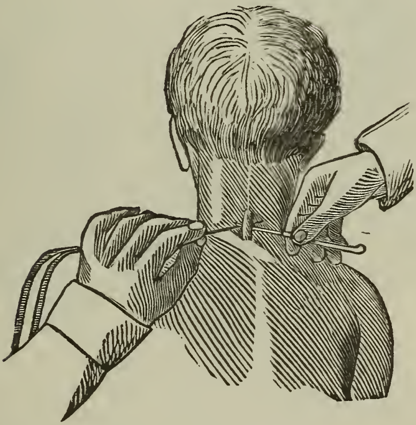
A Seton is one of our most powerful means of keeping up a cutaneous discharge. Strictly speaking, the seton itself is merely the band or substance employed to irritate the part; though the name is often given to the operation by which this band is introduced beneath the skin. Its application is now very generally confined to the back of the neck, though it may be also applied to certain other parts, as the fleshy part of the thigh, or arm; but in these points, issues are generally preferable.

In order to apply a seton, we require a sharp cutting instrument to make an opening through the integuments, and some strip which, when introduced, may, by its irritation, keep up a suppuration from the part. For the insertion of the strip we have two instruments, Boyer's Seton-Needle, and a common straight bistoury and eyed probe.

The first consists of a flat steel blade about five inches long, six lines wide, and perforated at one end with a hole large enough to receive the strip to be introduced; the other end is sharp, and sloping to a point like a thumb lancet. To introduce the seton with this, first fasten the substance to be used in the eye of the needle, and then seizing a portion of the integuments, of the required width, between the forefinger and thumb of one hand, raise it up from the parts below, and transfix its base by forcing the needle through; and drawing it and the seton out on the opposite side to that on which it entered, leaving the seton in the wound. After which, its ends should be fastened down by a little piece of adhesive plaster, and the whole covered by a warm poultice, till suppuration commences; when a simple dressing is all that is requisite.

The objections which I have to this method are, that the seton needle is not always at hand; that the fastening of the seton in its eye is apt to make a thick mass, which passes through the opening with difficulty, and that it is hard to seize the point of the needle, when wet with blood, so as to draw it through. I therefore prefer the straight bistoury and eyed probe, as generally resorted to by the French Surgeons. To use this, fix the seton by a thread to the eyed probe; seize the integuments as before; cut them with the bistoury, and before removing it, introduce the point of the probe from the opposite side, and withdrawing it and the bistoury at the same time, insert the seton in its place (Fig. 199).

*Fig.* 199.



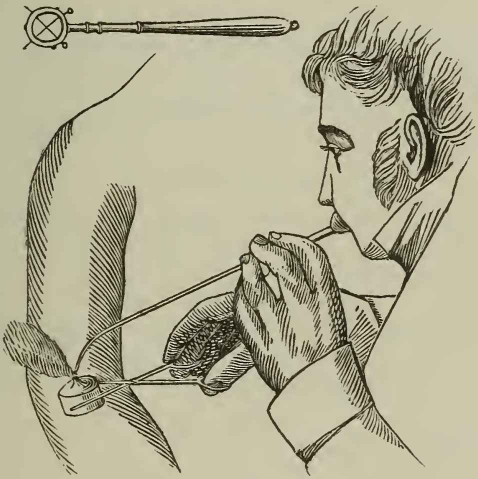
In respect to the substance of the seton there is much diversity of opinion; but let the substance be what it will, it should always be well anointed with ointment previous to its introduction, and also previous to any movement of it through the wound in subsequent dressings, in order to facilitate its progress or increase its action. For the first three days the poultice is stained by blood, or slight oozings; but afterwards by pus. When suppuration has freely commenced the substance of the seton becomes charged with matter, which, if allowed to remain, renders it very offensive. At each daily dressing, therefore, the seton should be drawn through the wound till this soiled part is free, when it should be cut off, and the ends fastened down and dressed as before with simple dressings; the whole being confined by a circular bandage of the neck, as at Fig. 33, or by a sling, as at Fig. 85. As the seton by this operation is soon cut up, it will ultimately be necessary to prepare for the introduction of a new one. This is readily accomplished by attaching it by a few stitches to the old one; anointing it well, and drawing this into its place, as the old one is removed. A skein of saddler's silk, or a piece of silk braid, is the article most frequently employed; but where we can obtain a strip of gum-elastic, or braid or tape coated with it, they will be found to be much more cleanly than the silk.

## OF MOXA.

This is the name given to little rolls of inflammable matter, intended to cause eschars, by being allowed to burn upon the integuments until they cause its destruction. They are made of various substances, as cotton, lint, tow, &c., soaked in a saturated solution of nitre; then dried and wrapped up in little bags, or rolls of silk, or muslin, sewed together at the sides, and formed into rolls and coated with gum.

Or, the common punk, as found in the shops of the tobacconist, cut into pieces about one inch long, will answer the same purpose. The application of any of these cylinders is very simple. Having chosen a spot where the subjacent parts of importance are not likely to be injured by the extension of the inflammation, place upon it a piece of moistened cloth, with a hole in its centre large enough to receive the moxa. This cloth is intended to preserve the surrounding parts from the sparks which sometimes escape. Next see that the end of the moxa is applied to the part perpendicularly, so that it may fit itself accurately to the surface; then moisten it with a little gum to make it adhere, or else hold it firmly on the part by a pair of forceps, or a porte-moxa or metallic ring, as in Fig. 200. Having now lighted one end of the cylinder, keep up the combustion by the breath, or by a pair

*Fig.* 200.



of bellows, the latter being necessary where the smoke irritates the bronchia too much. On its application and burning, the patient first feels a gentle heat, which gradually increases, until, as the fire approaches the part, the pain for the moment becomes excruciating, but diminishes as the fire destroys the vitality of the skin. The eschar thus formed being afterwards treated like the eschar created by the caustic, the issue is readily created, and the subsequent treatment will be similar to what was there said.

## CHAPTER IV.

### OF PUNCTURES.

In various cases of accumulation of liquids and gases within the cavities of the body, it is found necessary to evacuate them by a class of operations which divide the tissues in a manner somewhat analogous to incision, yet differing from them not only in the instruments employed, but also in the method of using them.

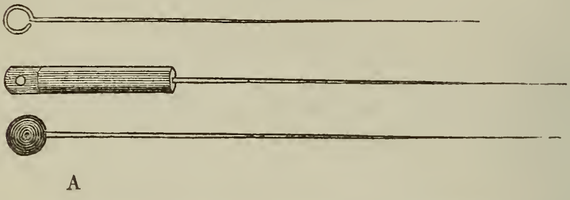
In these cases, perforations are made by sharp-pointed instruments, of different kinds, being pressed or pushed beneath the skin, by a sudden movement, so as to divide the tissues by pressure, instead of by the saw-like action of the knife or bistoury.

### OF ACUPUNCTURATION.

The simplest puncture that can be termed an operation, is that made by the introduction of needles under the skin. With the exception of their employment in exploring doubtful tumours, &c., their use is mainly confined to what is known as Acupuncturation. This consists in making a number of small punctures in the skin by means of needles of gold, silver, platina, or steel, shaped as in Fig. 201, and introduced into the part by rapidly rotating them between the fingers. Marked benefit, in certain cases, was said to have been derived from their use, and as they caused but little pain, the operation was at one time quite popular. Employed from an early period by the Japaneese, and others, in order to relieve various internal disorders, so rapid was their action, that miraculous powers were wildly ascribed to them.

Subsequent investigations have not, however, supported this elevated opinion, and want of success has

*Fig.* 201.



driven the operation therefore into comparative dis use. Without discussing the advantages of the operation, I shall, therefore, now simply detail the method of its performance. The place being chosen, take hold of the head of the needle, or of the handle into which it is sometimes inserted, with the thumb and fore-finger of the right hand, supporting its stem with the thumb and forefinger of the left. Press it, with a rotary motion, to the depth of several inches if requisite to reach the seat of pain, and leaving it there, introduce several others at slight distances apart. If the needles are sharp, and rotated rapidly, the pain of their introduction is very slight, and in certain neuralgic cases especially, there use is even said to be agreeable to the patient.

But without trusting to the effects of imagination, we may have more confidence in another method of treating such patients, which has an additional recommendation in the employment of a narcotic. This consists in making numerous punctures with these needles, or with a sharp-pointed lancet, so as barely to draw blood, and then washing the part with a strong solution of sulphate of morphia, or by painting it with the strong tincture of the root of the Aconitum Napellus. The application of the anodyne thus directly to the seat of pain, is said to relieve it very quickly, and must, I think, prove serviceable: although I have never had occasion so to use it.

The application, however, of the ointment of aconitine, in the proportion of one grain of the aconitine to the drachm of lard, as recommended by Turnbull and others, has in my hands destroyed the pain of the most intense facial neuralgia within a half-hour.

## ELECTRO-PUNCTURE.

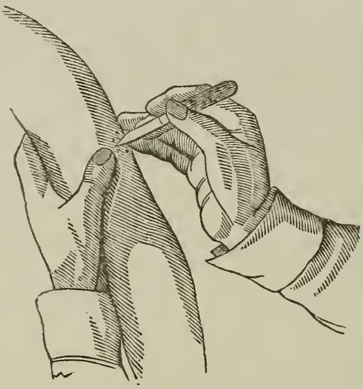
The advances recently made in the science of galvanism and electricity has again reviewed the operation of electro-puncture. This operation is the same as the preceding, so far as the introduction of the needles, but differs subsequently, in its being aided by the action of the electric fluid directly on the diseased part. In using this fluid we must of course be governed by its general laws, and if we wish to produce only slight shocks, cause the spark of the apparatus employed, to fall indirectly on the head of the needle, shaped as at A, Fig. 201; but if a more severe action is desired, keep up a continual current through the needle, by direct contact with it, of the poles of the machine. The Electro-Magnetic apparatus is applied in the same way as the electrical machine, and it matters but little in what way the fluid is applied to the needles, provided the circuit of the current is continued throughout them. The cases in which it is adapted, and their probable results, may be found fully treated of in most of our Dictionaries, under this head.

## VACCINATION.

Nothing need be said, at the present day, as to the advantages of this operation. Trifling as it is, its proper effect depends in a great measure on its correct performance, and passing by, therefore, much that has been stated in regard to the shape, size, and number of the punctures, I shall merely mention the plan that I pursue and have very generally found successful.

Scrape slightly the epidermis, on the spot selected, with a moderately dull thumb lancet, until it removes a small amount of the cuticle, in the shape of a light dust. As soon as the skin underneath becomes pink, or shows very minute points of blood, place a drop of the liquid from the pustule, or from the dried scab, softened and made liquid by water, upon the abraded surface, and press it beneath the skin by three or four slight punctures with the point of the lancet (Fig. 202), just deep enough to tint the matter with the blood, but not so as to make the part bleed freely; then keep the arm exposed to the air until the matter dries or hardens. In order to guard against subsequent irritation, tie up the child's sleeve to the shoulder, or cover the spot operated on with a piece of fine linen.

*Fig.* 202.



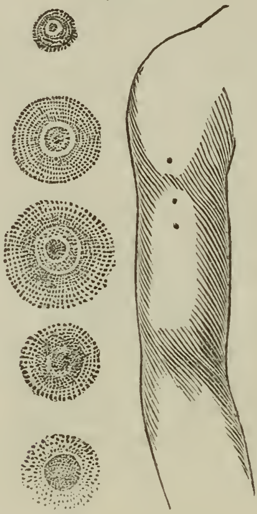
The choice of the lancet, the point of the arm to be selected, the age of the patient, &c., have all received much minute consideration in the different treatises on vaccination, but I think it is useless here to refer to them. Suffice it to say, that the sooner a child is vaccinated after one or two months, the better; that the point of insertion of the deltoid muscle on that arm which is furthest from the nurse when the child is carried, is generally the most convenient place for the operation: and that a plan that answers well is that just stated.

The necessity for obtaining good matter, renders the preservation of it a point of considerable importance, and various plans have been employed for this object, and strenuously advocated by their especial supporters. Jenner received a drop of the matter, fresh from the pock, in a little hollow of a square piece of glass, which was then covered by another piece, and both luted together to keep out the air. Bretonneau, Friard, &c., of the French surgeons, employed glass tubes of a fine calibre, with the same view; but in this section of the United States, the matter is generally preserved in the dried state, and transmitted from one point of the country to another by mail: being pulverized and moistened with a drop of warm water when required for use. A simple plan of preserving the dried scab free from the air, is to make a little hollow in a cake of bees-wax: then soften the surface of this and another cake by heat, or scrape them perfectly smooth, and after placing the scab in the hole made for its reception, press the two cakes together, so as to form an air-tight box. I have vaccinated successfully in several instances with a scab four months old, preserved in this manner.

The appearance of the arm, on the different days after the operation, is a matter of vital importance in forming an opinion of the results of the case; and as an error of judgment here, by giving the patient a false security, might lead to sad consequences, I shall not pretend to enter fully into its appearance, but refer the reader to the larger works.

Figure 203 is an attempt to represent the proper appearance of the arm at the third, seventh, eighth, ninth, eleventh, and twelfth days after the operation. But it does so very imperfectly, owing to the absence of color. Those unacquainted with it must, therefore, consult some of the more finished plates on this subject, and only look to the cut as an outline.

*Fig.* 203.



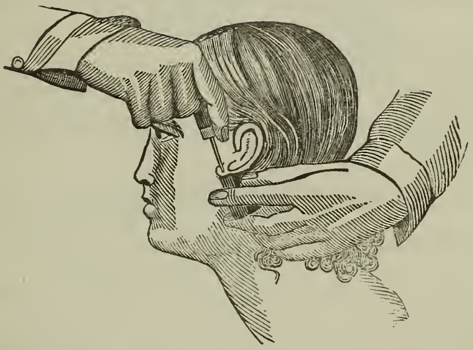
## PUNCTURE OF THE LOBE OF THE EAR.

The fashion of the day, and the taste of a numerous portion of the community, leading them to the use of rings in the lobe of the ear, it may occasionally happen that the practitioner will be called on to introduce them, although generally this is the business of the jewellers. As serious inconveniences have, however, frequently resulted from its performance by jewellers, &c., and as it occasionally affects very materially the comfort and health of the individual, it would perhaps be better were the profession to have a closer supervision of this little operation than is now generally the case.

The perforation of the lobe of the ear may be accomplished either by a large needle; by a small trocar and canula, like that used in hydrocele; or by a small punch similar to that employed by saddlers.

In either case, the lobe should be steadily pinched between the thumb and fore-finger for a few minutes previous to the operation, in order to diminish its sensibility; then placing a piece of cork beneath the point to be perforated, force the needle or punch rapidly through the flesh, so as to make a free opening (Fig. 204). Immediately on withdrawing the instrument, introduce a waxed thread, or a fine leaden ligature, or a piece of catgut, and move it daily through the perforation, in order to prevent its sides from adhering. Not unfrequently this movement

*Fig.* 204.



produces so much irritation and discharge, as to constitute a regular seton, and is occasionally employed by the lower orders of society with this view, for the relief of sore eyes. But generally, after the lapse of ten days, the skin on the sides of the wound heals, and an opening is left through which the ear-ring is afterwards passed. I have several times known instances, when the needle alone was used, where subsequent union of the wound has required the repetition of the operation. The punch by removing the piece effectually prevents this, and is, therefore, the preferable instrument.

The point selected for the perforation should always be sufficiently far from the extremity of the lobe to prevent the weight of the ring, or accidental catching of it by children, from tearing it out. When this happens, a marked deformity is produced, which, if the wound is not united soon after its production, will require on operation similar to that for hare-lip.

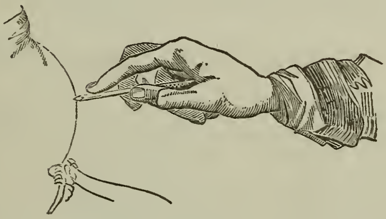
### PUNCTURE OF THE MEMBRANE OF THE TYMPANUM,

And that of the mastoid cells, might next be treated of; but they involve so many points of importance, as to exclude them from consideration in a volume like the present.

### PARACENTESIS ABDOMINIS,

Or *Tapping*, becomes necessary whenever (owing to some general disease) a large amount of serum accumulates in the peritoneal cavity of the abdomen, and by its distension impedes the respiration of the patient, or is otherwise productive of harm. As usually performed, a trocar and canula are employed, which, perforating the abdominal parietes, give exit to the fluid contained within it. The spot generally selected for the puncture is in, or near the linea alba, or two inches below the umbilicus: because we are here free from all danger of wounding important parts. The spot being chosen, place a broad band, slit at its extremities into six tails (like the bandage of Galen, p. 127), around the abdomen, with the tails crossed on the back of the patient, and direct two assistants to tighten it gradually as the fluid escapes, in order to force out the serum, and at the same time prevent the patient's fainting from the sudden loss of pressure on the abdominal vessels. The bladder being emptied, the surgeon should next remove a small piece of the bandage, immediately over the point which he proposes to perforate, and holding the trocar, as represented in Fig. 205, suddenly force it and the canula into the abdomen. Holding the canula in its position, and withdrawing the trocar, the fluid immediately escapes through the canula into the basin held in front of the patient. A tub or bucket should always be at hand, into which it may be emptied when required, as the amount of fluid is sometimes very large. After the evacuation of the liquid, the wound is to be closed by a strip of adhesive plaster; the bandage tied tightly in its place, and the patient put to bed and kept on strict diet. But as peritonitis frequently results from this operation, simple as it appears, the young practitioner is advised to be careful of his patient for

*Fig.* 205.



several days afterwards, and especially cautious of his diagnosis in the case of females. As the cause of the disease is not affected by the operation, it generally happens that its repetition is almost indefinite, though the subsequent performance does not differ in any respect from the one just described. The kind of trocar used is somewhat a matter of taste; but I always prefer the flat instrument, as creating less pain and causing a smaller wound than that which is rounded. In either case, particular attention should be given to cleansing the trocars after the operation, as the rusting of the trocar in the canula frequently renders it difficult to withdraw the former. In one instance that came under my notice, the instrument was driven into the abdomen, and the operator obliged to withdraw it, owing to his inability to free the trocar. A little oil after using it, or its examination previous to the operation, would have saved him this mortification.

## PUNCTURE OF HYDROCELE.

The evacuation of serum from the Tunica Vaginalis Testis, is generally produced by means similar to those just detailed. As the occurrence of hydrocele is by no means rare, as the operation is simple, and one that almost any physician can perform without risk or even any great trouble, I would recommend it to a more general attention on the part of medical practitioners, having seen much suffering caused by physicians refusing to tap these tumours. When satisfied of the existence of a hydrocele, let the operator seize the scrotum with his left hand, and squeeze it firmly from above downwards, as represented in Fig. 206. Then taking a small trocar and canula in the right hand, as shown in the figure, plunge it into the tumour, directing it obliquely upwards, in order to avoid injuring the testicle, which, under ordinary circumstances, is found at the posterior inferior portion of the swelling. Fig. 207 shows, in outline, the effect of puncturing a hydrocele

*Fig.* 206.

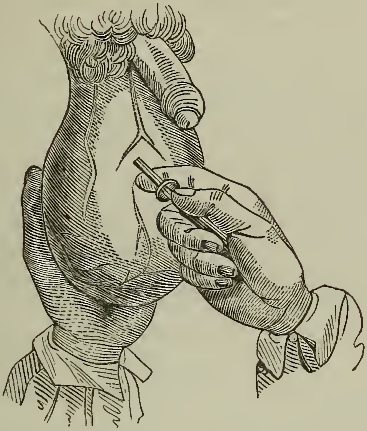
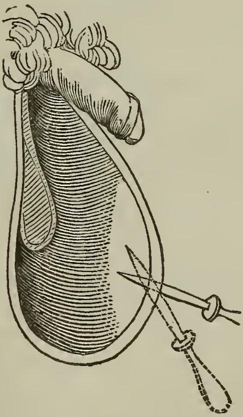


*Fig.* 207.



directly backwards, the trocar if continued being likely to pass directly into the testicle. The dotted line shows the proper course of the puncture. Should a trocar not be at hand, a thumb lancet may be used in the same way, and the wound kept open by a probe until the fluid is evacuated. But the trocar is far preferable, as it avoids the risk resulting from the escape of the liquid into the cellular tissue of the scrotum. The operation is, however, merely palliative, unless inflammation of the serous cavity be afterwards induced.

Should a practitioner be so situated as to render it obligatory on him to perform a radical cure, he must, after evacuating the fluid, introduce either a seton or stimulating injection, according to circumstances. But as I do not wish to recommend the the radical operation to every practitioner, the reader is referred to the works on Surgery for further details.

The Diagnosis of the diseases concerned in these operations is, I think, decidedly the most important point connected with them, and I would, therefore, invite attention to the means usually found effectual, in deciding it. In Ascites, the previous history of the case: the probability of pregnancy: disorder of the liver, or heart, or kidney, or some other organ, will do much towards preventing mistakes. Yet even then, nothing but the absolute certainty of the effusion should render the operation justifiable. This may generally be proved beyond a doubt by placing one hand, fully expanded, upon one side of the belly, and then tapping lightly and quickly, with the points of the fingers of the other hand, on the opposite side. The force of the tap acting upon the fluid will drive it to the opposite hand, and a distinct succussion or fluctuation be perceived under the one first extended on the abdomen. Should flatus be present, the tympanitic resonance will indicate it, but there will not be the wave-like sensation given to the hand, by tapping the fingers on the side of the belly, which is always felt if there be a sufficient amount of effusion to justify its evacuation.

In Hydrocele, the most certain test of its existence is the following: Place the patient in a dark room, and then grasping the scrotum tightly, hold a lighted candle as near as possible to the scrotum, without burning the patient. The liquid, if serum, being perfectly transparent, the testicle will be seen as a dark mass, wherever it may be situated, and of course avoided in the puncture. This will also be found a most useful test in diagnosticating hernia, sarcocele, or hæmatocele, as the appearances of these are entirely different, being darker than that of hydrocele. This testing the existence of hydrocele by a light is so simple, that every practitioner should be able to diagnosticate an effusion into the Tunica Vaginalis under ordinary circumstances; and if practised more frequently, would prevent the evils which occasionally result from the patient being directed to wear a truss, &c., in consequence of the practitioner's belief in the existence of hernia.

## RANULA,

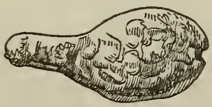
Or an accumulation of the salivary secretion in the sublingual ducts, requires an operation not only to remove the fluid, but also to guard against the permanent closure of the opening made. This operation may be performed either with a thumb lancet, bistoury, or trocar, by elevating the patient's tongue, and pushing the instrument directly into the tumour, parallel with the alveolar processes of the lower jaw. After the escape of its contents, it is then necessary to introduce something into the wound to keep it open. A simple instrument, for this purpose (analogous to that of Dupuytren), may be made by bending a piece of fine, stiff wire, two inches long, upon itself, so as to give it the shape of the letter V, and introducing the point of the V into the cyst, the elasticity of the wire will be sufficient to dilate the opening until the chance of its union is past.

Breschet and others have thought that Ranula, instead of being an obstruction of the duct, was caused by regular cysts. Be this as it may, the operation of excision of a portion of the surface usually suffices for their cure.

## OF SALIVARY CONCRETIONS

Depositions of earthy matter, chiefly phosphate of lime, are occasionally found in the openings of the salivary ducts, and when of any size, give rise to considerable inconvenience by impeding the enunciation and deglutition of the patient. When large, they may be readily removed by an incision on the parietes of the duct, and seizing them with forceps; but when small, they are not so easily caught, as they slip back in the line of the duct. Under these circumstances, it has been recommended to cause the patient to chew any substance likely to excite the flow of saliva, after making a slight incision; the escape of the fluid generally bringing away the concretion. A figure of a salivary concretion, taken from Liston, is represented in the cut, and gives a good idea of their shape and size, though occasionally much larger. I have seen one which was so large as to fill up the space beneath the tongue, and resembles a large Ranula, except in the colour and consistence of the tumour.

*Fig.* 208.



## PUNCTURING OF ABSCESSES.

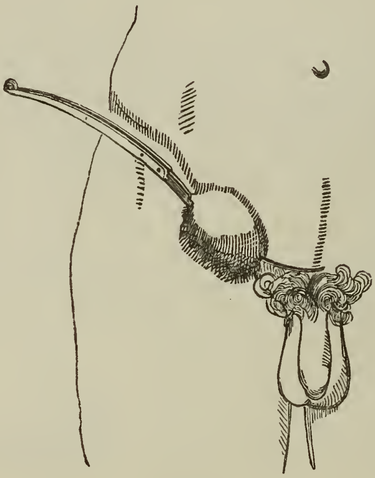
The existence of pus under certain tissues, especially under fascia, renders its detection and early evacuation often a matter of considerable importance, in order to prevent its extension, and the consequent injury of surrounding parts. To the young surgeon, and often to those more advanced, few things are more deceptive, and occasion greater doubt as to the evidences of its existence than these accumulations of matter. In examining a deep-seated part where pus is suspected to exist, even when care is taken, deception is apt to ensue, unless pressure is made in the proper manner, as may be readily proved by the following simple experiment: Place the muscles of the thigh or leg in a state of relaxation, and press on any given point with two fingers of each hand, *alternately;* the sensation of fluctuation will be so distinct as to deceive any one unacquainted with the fact. Now, if under the suspicion of the existence of pus, pressure is made in the same way, an operation for its evacuation might be urged, and the practitioner mortified in not finding the matter, of whose existence he felt so certain.

Previous, then, to opening an abscess, render the fluctuation apparent by the following means: Press one or two fingers of one hand firmly on the side of the point suspected, and keep them thus firmly fixed: whilst pressure is first made and then removed, by the application of the fingers of the other hand. If matter exists, it will be forced against the fingers first applied, and the fluctuation rendered certain; whilst, if it does not, the deceptive movement of the muscles of the part, first referred to, will be prevented.

The existence of pus being positively established, its evacuation by puncture may be performed either with a sharp-pointed bistoury, or abscess-lancet, by plunging it into the collection at right angles to its surface, and enlarging the opening by cutting outwards and upwards; or by introducing it perpendicularly to the surface until it enters the cavity (as shown by the want of resistance), and then cutting outwards. Or, if the abscess is superficial, the bistoury may be thrust through it, and a free opening made simply by elevating the handle, and cutting from within outwards, as in Fig. 209. The subsequent treatment will depend upon the circumstances of the case.

Of the use of Potassa for the evacuation of abscesses, I have nothing to say; preferring the knife for this purpose.

*Fig.* 209.



In large deep-seated abscesses or tumours, the contents of which are doubtful, the introduction of a grooved needle, or one somewhat coarser than those used in Acupuncturation, will frequently enable us to decide on their contents, and save much trouble to both patient and practitioner.

# CHAPTER V.

## OPERATIONS FOR ARRESTING HEMORRHAGE.

THE existence of hemorrhage generally creates so much alarm, and actually involves so much responsibility, that little need be said, in reference to the importance of a proper plan of treatment; common sense alone dictating the necessity of arresting it at an early period, lest its amount debilitate or affect the life of the patient.

Of the various operations required for this purpose, the simplest is undoubtedly that of Pressure, which, in common with the other means required, I shall treat of, without further reference to its physiological effect, than the simple statement that, when long-continued, it favours the formation of a clot, in and around the divided vessel.

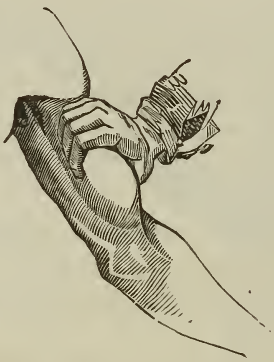
### PRESSURE FOR ARRESTING HEMORRHAGE

May be applied either by the Fingers, by Compresses and Bandages, by the Spanish Windlass, or by the Tourniquet.

In the first, the application of the force will depend upon the position of the part and the circumstances of the case, and as the hemorrhage from the arteries is that which is of the most importance, I shall confine myself to it. When blood escapes from an artery, it does so in jets, corresponding with the pulsations of the heart, and is of a bright red colour. This jet generally shows the position of the injured vessel, and the origin of the hemorrhage, if superficially seated. The introduction of the point of the finger to the bleeding vessel, and pressure at that point, will therefore generally suffice to arrest it until more powerful means can be obtained. But if the wounded vessel is deep-seated, and the point wounded cannot be thus seized on, pressure must be made upon the artery at some point of its course, above the seat of injury; that is, between the heart and the wound.

This pressure may be made either with the points of three or four fingers, closely placed together; or by the thumb. If the Fingers are used, place their points close together in the course of the artery, and seize the opposite side of the limb with the thumb, so as to steady them (Fig. 210), or place the point of the thumb upon the vessel, and the fingers on the opposite side of the limb, and when the pressure fatigues the thumb, place that of the other hand on top of the first, and thus relieve it (Fig. 211). But even when possessed of great powers of endurance, few persons can continue this sort of effort except for a few minutes, and these means are therefore only available for a limited time, as the fatigue soon requires a release of the hands employed.

*Fig.* 210.



When it is absolutely necessary to employ pressure for a long period, as upon the Sub-Clavian or Iliac Arteries, a large key, wrapped around with bandage, so as to prevent the handle from injuring the soft parts, will prove an excellent instrument, and far preferable to the fingers or thumb, not only on account of its adaptation to the shape of the part, but also because the pressure may thus be continued for a greater length of time.

*Fig.* 211.

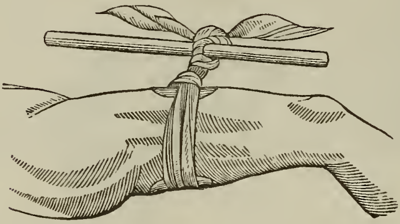
The French surgeons frequently employ pressure to arrest the circulation in a limb during amputations; but as its success depends upon the strength and address of the assistant, I would not advise its employment, as a general practice, where a tourniquet can be had.

The use of compresses and bandages for this purpose, has been already referred to (page 41), and require no addition to what was there mentioned.

### THE SPANISH WINDLASS

Is an excellent every-day instrument, of considerable power, and yet of great simplicity. It may be made on the spur of the moment, by twisting a pocket-handkerchief, and tying a knot in its middle. Then placing the knot over the vessel, tie the ends of the handkerchief loosely on the opposite side of the limb:

*Fig.* 212.

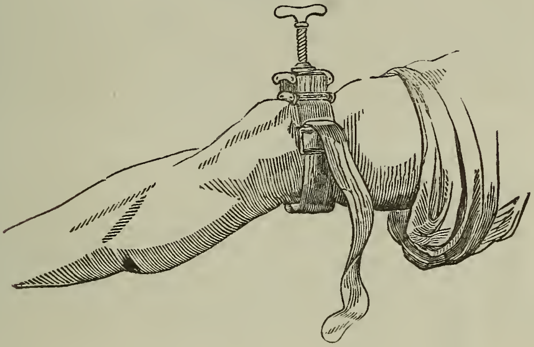


and introducing a stick into the loop formed by the ends, twist the handkerchief by turning the stick, as represented in the cut (Fig. 212).

### THE TOURNIQUET OF PETIT,

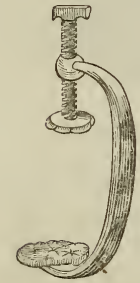
Or the tourniquet of the amputating case, being the one most generally employed in the United States, should be applied as follows: Place a compress over the vessel, and surround the limb with two or three turns of a bandage, so as to bind the compress on the part, and thus protect the skin from being chafed by the strap of the instrument. Next place the plates, closely screwed together, directly over the compress, and strap it firmly in its place, without any reference to the position of the buckle, as the plates, and not the buckle, are to make the pressure. On screwing the instrument, the compress will be firmly forced on the vessel, and the circulation arrested, in consequence of the separation of the plates by the action of the screw, the lower part of this being made to bear directly on the compress. Many surgeons, however, advise a different plan from this, preferring to place the pad of the buckle over the vessel or the plates on one side of the limb, and a compress under the strap on the side next to the artery, believing that the strain upon the pad under the strap will make more decided pressure; but the method just stated embraces, I think, the intention of the inventor, and is free from the objection of many of the accidents likely to arise from the use of the instrument in other ways. In amputations, the limb should be elevated a few minutes previous to the application of the tourniquet, in order to empty the veins, and save the loss of blood which otherwise follows the division of these vessels. All such means of arresting hemorrhage are, however, temporary; and I would caution the young practitioner against relying on pressure for more than an hour, or an hour and a-half: as the arrest of the circulation in the limb for a greater length of time might, in some cases, produce mortification. I once saw a thigh amputated on account of a slight incised wound of the knee; which opening one of the small articular

*Fig.* 213.



arteries of the part, gave rise to hemorrhage, and which an ignorant practitioner attempted to arrest by the use of a tourniquet applied to the femoral artery, and kept there, notwithstanding the sufferings of the patient, for two days; when mortification became apparent. The evils resulting from the continued application of the tourniquet of Petit, have rendered a spring tourniquet, or one which only presses on two points of the limb, a favourite instrument with many surgeons. In the treatment of aneurisms by compression, especially since the publication of the excellent papers of Mr. Bellingham, of Dublin, this instrument has proved very useful. Fig. 214 explains it at a glance. One pad rests on the point opposite the vessel, and the other is pressed upon the artery, by means of the screw attached to it.

*Fig.* 214.



The success which has attended the treatment of aneurism by this instrument, and its simplicity, may well recommend it to the attention of all, but especially of those practitioners who are unwilling to attempt the ligature of the vessel.

Whenever an aneurism exists in an extremity, Mr. Bellingham directs the use of two such compressors, as follows: Suppose an aneurismal tumour of the Popliteal Artery; Place the patient in bed and apply the compressors to the femoral artery, one in its course on the middle of the thigh, the other nearer the groin. Screw up either one, so as to compress the vessel and diminish the circulation through it; but do not apply it so firmly as to stop it entirely. Then, when the patient complains of the pressure, screw up the other compressor, and relax the first. With an intelligent patient the treatment may be left to himself. The object of the pressure is to favour the formation of a clot in the aneurismal sac, in consequence of the sluggishness of the current of blood which passes through it. A more detailed account will be found in Braithwaite's Retrospect, Part 13th, 1846, and in Rankin.

Whenever it is necessary, in cases of wounds, or after operations, to arrest the flow of blood permanently, the ligature or torsion must be resorted to; and as this, in important operations, falls more or less upon the assistants, especially when situated in hospitals, or in the navy or army, it will become their duty to prepare both the sponges and ligatures which are required for this purpose. The usefulness of both depends in a great degree on their quality; and I therefore subjoin the method in which I have generally prepared them. In order to obtain a good sponge, the assistant should select a soft, elastic, round piece, not smaller than a peach, and not larger than the fist. If too large it will be clumsy, and pressing on a large surface, when applied, cause unnecessary pain. As found in the shops, even the best sponge contains more or less calcareous matter, which renders it unfit for surgical purposes. The first step in its preparations is, therefore, to pound it whilst dry, and then wash it thoroughly in water to remove the loose sand. Next, place it in a non-metallic basin, containing enough muriatic acid and water to cover each piece, varying the strength of the mixture according to the quality of the sponge. But even the finest sponge will bear it without any injury to its texture, in the proportion of one part of the acid to sixteen parts of water. After remaining in this mixture about two hours, or until no hard particles can be felt, the sponge should be thoroughly washed in fresh water, and then allowed to soak about one hour in a solution of carbonate of soda, one ounce to the quart, when being again thoroughly washed and soaked in water, which is frequently changed, it will be ready for use. Sponge of a good quality for surgical purposes should be soft, and so elastic as to be able to recover its shape when moist and compressed in the hands. Its cells, therefore, should not be finer than mustard seed, as it is then apt to clog with the blood, and become flabby or cotton-like.

The whiteness of sponge, further than that afforded by the above method of preparing it, is of no consequence, the chlorine with which it is usually bleached tending rather to impair its usefulness by destroying its tenacity.

A first-rate piece of sponge is to an operating surgeon a valuable article, and difficult to obtain under ordinary circumstances, unless he prepares it for himself, and this he can readily do by pursuing the course just stated.

In applying a sponge to cleanse a bleeding surface, the assistant should place it boldly and quickly on the part, so as to compress its cells, and then as it expands in his fingers remove it, wash and reapply it by a rapid movement. The water used to wash the sponges during an operation, should not be of a higher temperature than 65°, under ordinary circumstances, though occasionally warm water may be required. A good piece of sponge attached to a ligature, thrust into a deep wound, and there left for forty-eight hours, will often arrest that troublesome hemorrhage in which the blood seems to come from a number of points, and not any one vessel.

Next after sponges the assistant should look to the

## LIGATURES.

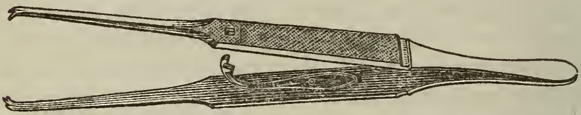
The material for ligatures has, for a long period, engaged the especial attention of surgeons, and an almost indefinite variety of substances have been recommended as especially fitted, by their unirritating character, to be introduced and left within the flesh. As nearly all ligatures eventually come away by suppuration, it is of little consequence what material they are made of, provided it is strong and sufficiently thick to prevent its cutting through the coats of the vessel too rapidly. Generally, the internal and middle coat of the artery are divided by the ligature, and the external coat ulcerates through; but in cases of disease, as ossification, &c., all the coats will yield quickly to a fine ligature. I, therefore, generally prefer a round ligature made of saddler's white silk. Of this, a single strand, well waxed, is sufficiently thick for the smaller arteries, as the coronary, &c.: two strands for vessels of the size of the Radial and Ulnar; three strands for the Femoral and Brachial; and four strands for the Iliac and Sub-Clavian.

In preparing these ligatures let each strand of silk be well waxed, and then let two assistants lay them together and twist them in opposite directions until firmly twisted, keeping the ligature stretched until the strands thus united are again lightly waxed. Then attaching each end of the ligature to a nail, allow it to remain stretched for several hours, otherwise it will be likely to untwist itself. Ligatures, as thus prepared, should next be cut into pieces about ten inches long, and laid side by side in a fold of moderately-stiff paper, wide enough to hold eighteen or twenty-four pieces. This paper being turned over at one end to the depth of an inch, will preserve the parallelism of the ligatures, and enable the assistant to draw out one at a time, without deranging and entangling the remainder.

In order to apply a ligature to a divided vessel, it is necessary to pick out the artery from the surrounding parts, and this may be effected either by the tenaculum or forceps.

The Tenaculum is the instrument generally preferred. It is used by sticking its point into the vessel and drawing it out from the wound, until the loop of the ligature can be tied over it. But if Forceps are desired, they may be employed as follows: Seize the vessel with a pair of Liston's, which I think decidedly the best for this purpose, and draw out the artery as before. Where the forceps, as in Fig. 215, are fitted with teeth, and have a spring in the handle, they will retain their hold of the vessel, even when allowed to hang, until the surgeon places the ligature, even without the aid of an assistant. The firmness of their hold has given them the name of bull-dogs.

*Fig.* 215.



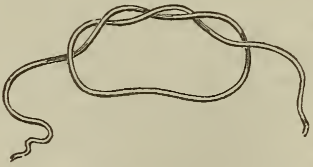
In tieing a ligature, one loop should be thrown around the extremity of the vessel, beneath the instrument, and tied. Then forming a second knot on the first tie, draw it tight, by using the thumbs in the way that a shoemaker draws his wax-end, and not by pulling it with the fingers, as a school boy ties his shoes.

Various knots have been recommended for the purpose of retaining the ligature on the vessel. Among the most common of these are those known as the surgeon's and the sailor's knot.

### THE SURGEON'S KNOT

Is made by passing either end of a ligature twice around the other, and drawing it tight. The figure (216) represents the left end, or that taken from the

*Fig.* 216.

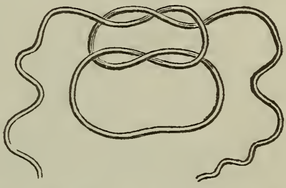


right hand, turned twice around the other, in order to form the knot, but not drawn tight. These turns, however, form a flat knot, like a figure of 8, and do not compress the vessel as tightly as the sailor's knot. It is therefore but little used at present.

### THE SAILOR'S KNOT,

Like the clove-hitch, is one, that when drawn tight, will hold very firmly all that is included within it. Owing, also, to the firm compression that it exercises on the vessel, it is the one most frequently employed, as it divides the internal and middle coats more rapidly. In order to form it, tie a knot as in the lower loop of Fig. 217, and then a second or third on top of that, drawing each knot firmly with the thumb in the manner just referred to. Or, if the figure is not sufficiently plain, practise the turns as follows; take a turn of the ligature around the finger, passing from left to right, and bringing the right hand end around the left; knot it firmly; then bringing the left hand end around the right, reverse the first turns, and again knot it firmly. Should any doubt exist as to its firmness, a third or fourth knot may be formed on top of these, by the same turns: going first from left to right, then from right to left; and afterwards continuing the turns from right to left, as required.

*Fig.* 217.



In the application of ligatures to arteries in extensive wounds, one end should generally be cut off within a quarter of an inch of the knot, and the other brought out of an angle of the wound, in order to facilitate its removal. Occasionally, both ends are cut off, and the knot left to come away with the discharge; but the first plan is preferable for many reasons.

## TORSION,

Or twisting of the artery, arrests hemorrhage on the same principles as the ligature, so far as the coats of the vessel are concerned: viz., by lacerating the internal and middle coat. It is performed by seizing the end of the vessel with a pair of forceps which are made to close with a catch, and then rotating the instrument in the fingers, the artery is twisted upon itself. Although a favourite method with the French surgeons, and answering tolerably well for small vessels during extensive operations (as it saves the time required for the application of ligatures), yet it cannot be permanently relied on; and I would not recommend it except in the cases referred to, where ligatures may be subsequently applied if desired: secondary hemorrhage not unfrequently resulting from its use.

If the hemorrhage comes from a deep-seated vessel, it will frequently be necessary to cut down in its course, and throw a ligature by tenacula, or other instruments, around the artery, above the seat of injury. These operations are, however, generally so important, and depend so entirely upon the anatomical knowledge of the operator, that they would be misplaced if treated of here.

Besides that just considered, hemorrhage not unfrequently occurs from different cavities of the body, where, instead of one main vessel being the source, the blood comes from numerous small ones by a general oosing. Under these circumstances, styptics, or the introduction of foreign bodies into the part, in order either to make pressure or assist the formation of the clot, will be found necessary to arrest it.

Among Styptics, the direct application of the Nitrate of Silver to the bleeding surface will, I think, prove the best; or we may use the Tinctura

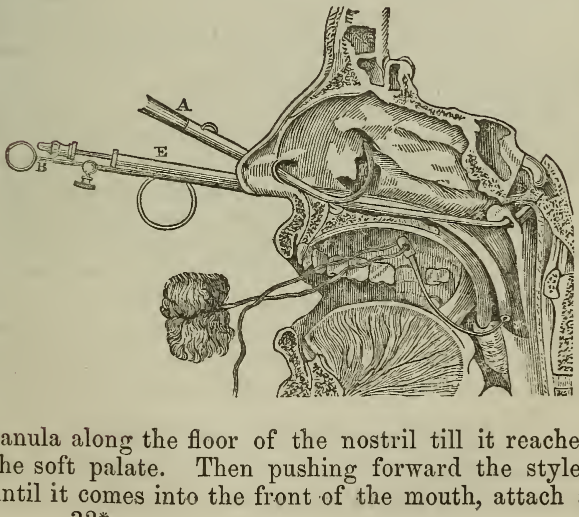
Ferri Chloridi, or Powdered Galls, or Sulphate of Iron, or Copper, or Zinc, or Acetate of Lead, or Alum, or Agaric, Matico, or Powdered Ice, or the Potential Cautery, &c., &c.

But where the bleeding cannot be thus stopped, plugging up the part, in order to assist in the formation of a clot, becomes necessary; the peculiarity of the tampon being modified by the cavity to be filled.

### PLUGGING OF THE NOSTRILS.

In order to arrest excessive hemorrhage from the nostrils, it is necessary to introduce a foreign body not only into the nose in front, but also into the posterior nares. This may be best accomplished by an instrument that should be found in all pocket-cases, viz., Bellocque's canula, armed with its stylet and ligatures. In using it, pass the point of the canula along the floor of the nostril till it reaches the soft palate. Then pushing forward the stylet until it comes into the front of the mouth, attach a

*Fig.* 218.



ligature in the eye of the instrument; then fasten a small piece of lint, spread with cerate or oil, or of moistened sponge not more than an inch long (Fig. E, 218), to the ligature; and drawing the stylet back into the canula, withdraw the latter and fasten the plug in the posterior nares by pulling firmly on the ligature, or on one portion of the double-thread which was attached to it: thus leaving one portion of the thread in the mouth, the other in the nostril. On stuffing the front of the nostril with any soft substance the whole passage will be firmly closed, and it only remains to fasten the thread coming from the mouth by adhesive plaster: or to tie the end from the nose and that from the mouth loosely together, to complete the operation. If the hemorrhage has been excessive, the plugs may remain three days, or at all events until a clot forms on the bleeding surface. When it is wished to remove them, pick out that in the front of the nostril, and introducing a probe, push the posterior one into the throat: or draw upon the lower thread, by which it may be drawn into the throat and mouth. This thread is that which was left attached to the plug.

If Bellocque's canula is not at hand, we may use a catheter with a double ligature fastened in its eye. This being passed through the nostril until the thread shows itself in the throat, draw the ligature out of the mouth by a pair of forceps: when, after attaching the lint to it, the whole may be again drawn through the posterior nares, and the thread confined as before. Sponge being softer and more absorbent than lint would be preferable as a plug, were it not that it is apt to become very firmly wedged in the posterior nares in consequence of its expansion.

## HEMORRHAGE FROM THE RECTUM

Occasionally gives rise to most serious results, and requires to be arrested immediately, in order to preserve life. As in most cases it is the result of some operation upon the part, the most certain means of arresting it is to employ a rectum speculum, and if the vessel can be seen, to tie it. But when this is not possible, resort may be had to compression by means of cotton or lint stuffud into a bladder like a sausage, and forced into the gut. Cold water or powdered ice may may also be thus employed, provided caution is used as to the effects of the cold on the system generally. The use of anything, however, thus introduced into the rectum, is accompanied by great inconvenience and difficulty of retention, from the expulsive efforts that it induces. In such cases, resort may be had to the actual cautery, after the the plan of Dupuytren; or where the bowel is kept distended with blood, the introduction of the nozle of a syringe, or a catheter, into the gut, will probably prove useful by keeping it empty, and thus permitting the closer contraction of the parts about the bleeding vessel.

## HEMORRHAGE FROM THE BLADDER

Is not of frequent occurrence, and still less frequently of such an extent as to require direct interference. Should it however occur, the principle to be observed would be, to keep the bladder perfectly empty by the use of the catheter, and employ cold externally or even introduced to the inside of the bladder itself, by means of a syringe and catheter.

# CHAPTER VI.

## OF WOUNDS.

These, if of a simple kind, and not involving parts of vital importance, generally require but little constitutional treatment: the attention of the practitioner being mainly confined to arresting the hemorrhage, removing foreign matter, and promoting the union of the divided surfaces. Of the first I have already spoken under its appropriate heading; the second will be treated of hereafter, and the third indication, or the union of the divided edges, now requires notice.

Coaptation of wounds may be accomplished by four means, that is by Sutures, by Adhesive Straps, by Bandages, as before stated, or by Collodion.

### SUTURES.

This is the name given to stitches which are intended to approximate the sides of wounds, especially when occurring in parts that are naturally loose and moveable. They are of five different kinds, as at present recognised, viz.: the Interrupted, Continued, Twisted, Quilled, and Dry.

### THE INTERRUPTED SUTURE

Is the one most frequently employed, and is made by introducing a needle similar to either of those in Fig. 219, armed with a simple ligature, through one lip of the wound from without inwards, and through the other lip from within outwards, at such a distance from its edges as will prevent the stitches cutting out too soon. Then drawing or pressing the sides of the wound together, tie the ends of the ligature moderately tight in a double sailor's knot (Fig. 217), taking care not to put too much strain upon the parts, lest the thread cut through the skin. In using the needle, carry it deep enough to obtain a firm hold, but not so deep as to include the tendons or fascia: making the requisite number of stitches at about an inch apart, and supporting them, if necessary, with a few adhesive strips or a bandage (Fig. 220, A). When, after the lapse of two or three days, it is wished to remove them, seize the knot with a pair of fine forceps, and cutting the thread, withdraw it carefully from the part: leaving the adhesive plaster for a day or two longer, in order to secure the union. When sutures are allowed to remain a longer time than this,

*Fig.* 219.

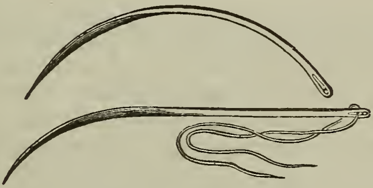
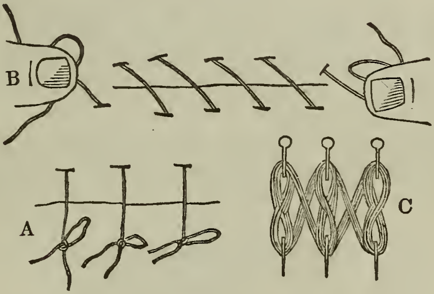


*Fig.* 220.



ulceration is induced, and this will eventually remove them, but leaves a ragged sore, and a more marked cicatrix. As all the advantages of their use are obtained in forty-eight or seventy-two hours, they are generally cut out at the end of the second or third day.

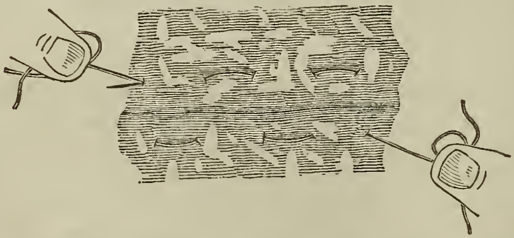
Sutures are not as much employed as they might be, on account of the horror that patient's entertain of the use of a needle in the flesh, and also of prejudice on the part of some surgeons. But the more perfect adhesion gained where parts are moveable, and the greater certainty of the continued approximation of the edges by these means, are strong inducements to their employment; and I must confess a predilection for them to a greater degree than that of most other practitioners.

### THE CONTINUED SUTURE,

Also called the Glover's Suture, is made by passing a needle and thread through and through the integuments as in ordinary sewing (Fig. 220, B). It is. however, seldom employed, except in wounds of the intestines, and in sewing up dead bodies, after post-mortem examinations.

Another mode of making the continued suture, and one that answers very well where it is desirable to make considerable traction on the threads, is that represented in Figure 221. The thread is passed

*Fig.* 221.



as represented in the cut, and as it includes more or less of the parts on the side of the wound, draws them together with almost as much firmness as the quilled suture. Like this, however, it is now but little used; but might be more frequently employed, with advantage, in wounds of the thigh, buttock, &c.

### THE TWISTED, OR HARE-LIP SUTURE,

Is made by introducing several pins through the sides of a wound, at a depth sufficient to hold firmly, and then twisting a ligature around each extremity in the shape of a figure 8 (Fig. 220, C). In angular wounds, the first pin should be placed at the lowest angle, in order to ensure a regular adaptation of parts, and then the others introduced at equal distances, say half an inch apart. After forty-eight hours, the pins should be withdrawn by the forceps, with a slight rotatory motion; but the ligatures may be left until loosened by the discharge, or subsequent dressings.

In the selection of pins there is much useless particularity; some surgeons directing silver pins with moveable steel points, in order that by their removal they may prevent the points injuring the adjacent parts; others advising round, and some square points. But one great objection to these moveable points is, that if it is necessary to withdraw the pin a little, in order to vary its point of exit, the steel point is liable to be left in the flesh. Silver, also, has no advantage I think over other substances; and the common cambric needles with sealing-wax heads, or a good stout pin of the ordinary kind will answer equally as well: as the point may be surrounded with a little pellet of wax after it is introduced, or may be cut off by a pair of bone-nippers.

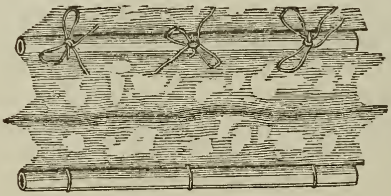
A very good hare-lip pin may be made of steel wire, cut to any length, and brought to a triangular point at one end, by a few touches of the file. I seldom employ any others.

In placing pins after the operation for hare-lip, considerable advantage may be gained by passing a fine ligature through each free angle of the flaps, previous to introducing the pins. By means of this ligature it is easy to bring the edges to the same level, and guard against the central depression or indentation which so often results; after the pins are placed, this ligature is to be removed. I have often noticed the difference in the result of the operations of the French and American surgeons in this respect, and believe the success of the former to be owing to this plan of operating.

## THE QUILLED SUTURE

Is intended for the union of deep-seated parts; but as its place can be well supplied by a compress and strips, or by a uniting bandage, it is not at present much employed. It is made by passing a number of double ligatures through the sides of the wound, and placing a little roll, or quill, or catheter, in the loop on one side and tieing the opposite ends of the ligature around another quill (Fig. 222). The ligatures acting on the quills, instead of directly on the skin, are enabled to force the parts more closely together, without the risk of cutting through the integuments.

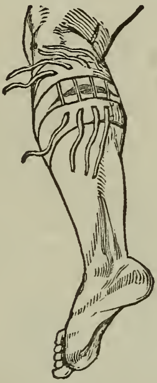
*Fig.* 222.



## THE DRY SUTURE

Is made by fastening strips of adhesive plaster on each side of a wound, and then approximating them, by tieing together the ligatures introduced into the strips of each side (Fig. 223). The difference between this and the interrupted suture is, in the former being passed through the adhesive strips instead of through the integuments, as in the latter.

*Fig.* 223.



A narrow piece of muslin, made to adhere to the skin by the use of Collodion, will also answer extremely well.

# CHAPTER VII.

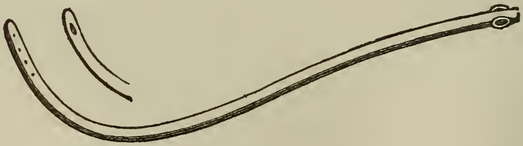
## CATHETERISM.

The introduction of tubes into the different passages of the body requires, in the first place, an accurate knowledge of the anatomical relations of the parts, and then some skill in the manipulation of the instruments. In most cases, the movements should be slow and gentle, rather than rapid and violent, and in the use of the instruments, especially as applied to the urethra, the object should be rather to introduce them without attracting the patient's attention, than to take him, as it were, by storm: as I have occasionally seen done, by the would-be dexterous operators.

### CATHETERISM OF THE URETHRA.

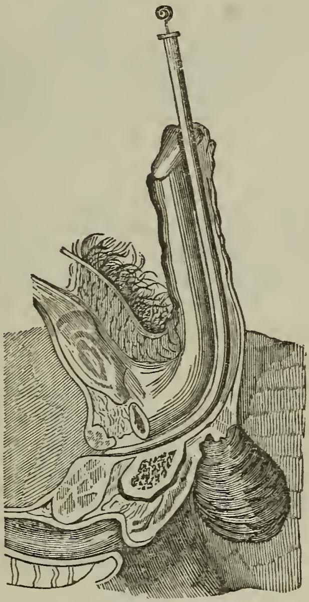
The passage in which catheters are most frequently employed, is undoubtedly the urethra. For this purpose the tubes are made of various shapes, sizes, and substance; but to one acquainted with the anatomy of the part, their shape is a matter of little importance, a straight instrument passing quite as readily as a curved one. Generally, however, the

*Fig.* 224.



male catheter is bent to the curve represented in Fig. 224; whether made of silver, caoutchouc cloth, or gutta percha, with an eye on each side, or with several perforations, according to the taste of the operator. When the gum-elastic catheter is employed, a wire or stylet is generally required to be introduced into it, in order to give the requisite stiffness, and prevent its yielding to any temporary obstruction that may be met with. In introducing a catheter, the simplest proceeding will be found to be the following:

*Fig.* 225.



Place the patient on his back, with the limbs and shoulders slightly elevated, in order to relax the abdominal muscles. Then, having oiled the instrument, take it in the right hand, by its mouth, and seizing the head of the penis between the finger and thumb of the left hand, so as to hold it perpendicularly to the patient's abdomen, place the catheter in the orifice of the urethra, and, whilst the patient's attention is engaged by conversation or otherwise, slide the point of the instrument gently down the urethra until it reaches the arch of the pubis, or can be felt deep in the perineum. Then gently depress the penis and catheter until the instrument is parallel with the patient's thighs, when the point will suddenly slip over the triangular ligament and enter the bladder, as is at once shown by the escape of urine. The cut (Fig. 225) represents the position of the instrument at the moment when it is to be laid parallel with the thighs. Should the patient strain, or resist the operation, rest for a moment, and passing the left hand gently over the abdomen, so as to promote relaxation of its muscles, try again to keep him in conversation, so as to prevent his holding his breath. But should there be no stricture of the urethra, little difficulty need be anticipated in the introduction of the instrument.

Various other plans of catheterism have been recommended, either for the surgeon's convenience, or to enable him to astonish the by-standers; but the above plan embraces the simplest means, and is the practice that I learned when following the practice of M. Civiale, a gentleman who is probably the most beautiful operator, in such cases, at present existing.

In old men the introduction of the catheter is occasionally a matter of considerable difficulty, owing to the enlargement of the third lobe of the prostate gland, which, from its projection into the canal, requires a modification of the instrument. In order to overcome this difficulty, it is necessary to elevate the point of the instrument more than in ordinary cases, as in Fig. 226. This may be accomplished either by bending the point slightly, previous to its introduction, by passing it for an eighth of an inch into the barrel or ward of a pocket-key: or by introducing a finger into the rectum, when the catheter has reached the gland, and then elevating the point.

*Fig.* 226.

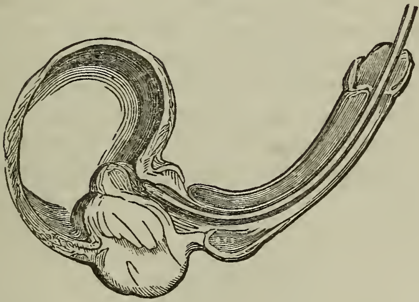
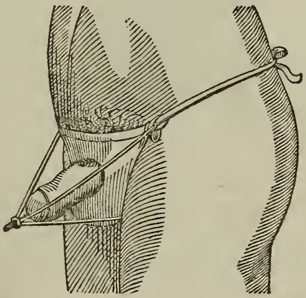


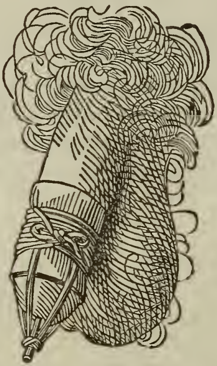
*Fig.* 227.



Or if the flexible catheter is used, withdraw the wire for a short distance, and then pass the instrument forwards towards the bladder.

In cases of paralysis, or of a tight stricture, it is frequently necessary, in order to save trouble, to retain the catheter in the bladder for several hours. In such patients, after having evacuated the urine, place a little plug or cork in the extremity of the instrument, in order to prevent the constant flow of water, and fasten the catheter either by attaching it with tape to a suspensory bandage, as represented in Fig. 227, or tie the tapes firmly around the end of the instrument; surround the body of the penis with a few turns of narrow bandage; and then either sew the tapes to it, or confine them by circular turns of another piece of tape, as represented in Fig. 228, taking care not to draw them too tight. As the penis is, however, liable to changes of size, the plan first recommended (Fig. 227) is, I think, preferable to this, or most of the others that have been proposed.

*Fig.* 228.



## A NEW MODE OF RELIEVING RETENTION OF URINE WITHOUT CATHETERISM.

As it occasionally happens that the physician unaccustomed to the manipulation of the catheter will fail in his attempts to introduce it, and as cases of strangury and retention of urine from spasmodic stricture are not uncommon, I would invite attention to the plan of M. Cazenave, as published in Rankin's Abstract, No. 10, December, 1849.

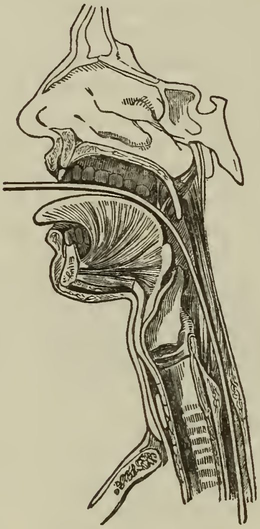
"When called to a patient labouring under complete or incomplete retention of urine, I immediately cause the large bowel to be emptied by an oily clyster, or prescribe a purgative one, if there has been no motion, for fifteen or eighteen hours. When the first clyster has been returned I make use of another, less in bulk, of cold water, or (what is better), bladders filled with roughly-pounded ice, are placed around the penis upon the perineum, thighs, anus, and hypogastrium. If the patient do not pass more or less water, after half an hour of this treatment, I have him laid on the edge of the bed with a waterproof cloth under him, and then subject him for twenty or twenty-five minutes to a cold ascending douche, in a small continuous stream. At the end of this time I give another cold lavement, and continue refrigerants, and in an hour I have generally been rewarded by success."

The simplicity of these measures, and the results stated by M. Cazenave, together with some personal experience in similar measures, would certainly induce me to try it under the circumstances above referred to.

## CATHETERISM OF THE STOMACH,

Or the introduction of a tube for the use of the stomach-pump, is performed generally without any difficulty, except that arising from the resistance of the patient in certain cases. Guarding, then, against the closing of the patient's teeth upon the fingers of the operator, or upon the tube, by placing a plug of wood or a knife-handle between the jaws, pass the point of the tube directly back into the throat with the right hand, and with the fore-finger of the left,

*Fig.* 229.

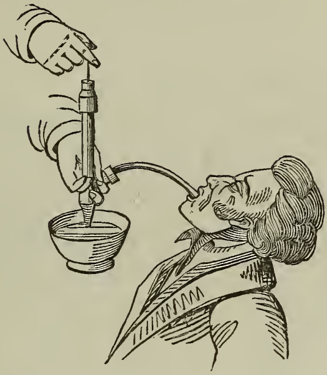


depress its point, when it is not bent in consequence of the resistance of the posterior walls of the pharynx, as represented in Fig. 229. The course of the œsophagus renders the subsequent progress of the instrument perfectly easy.

When it is necessary to wash out the stomach, or to introduce food, any of the various stomach-pumps that please the fancy of the operator may be used; but a common injection syringe will be found to equal all the arrangements of the more complicated instruments.

The action of the ordinary pump, and the relative position of both operator and patient, can be readily understood by reference to Fig. 230. The plug that is required to prevent the closing of the teeth upon

*Fig.* 230.



the tube is not shown in this cut, as it would have interfered with other points of the drawing.

In the use of the liquids to be introduced into the stomach, particular attention should be paid to their temperature, as the patient, from being deprived of the use of his mouth during their introduction, might otherwise be seriously scalded, either in the œsophagus, or stomach. Some practitioners recommend smearing the stomach tube with molasses, oil, or mucilage, previous to its introduction. To this there is no objection, although it is not absolutely necessary; dipping the tube into simple cold water answers equally as well, and is generally more convenient. On withdrawing the tube from the stomach, the operator should be careful always to place a finger on its open end, so as to close it tight, and thus prevent the escape of any liquid that might remain in the tube, into the trachea, as the tube passes the pharynx.

## CATHETERISM OF THE EUSTACHIAN TUBE

Is occasionally required, in order to overcome obstructions in the passage, which produce deafness by preventing the passage of sound along the canal. Without pretending to define the cases requiring this operation, I shall here simply refer to the operation itself, from a belief that many who are fully aware of its utility would perform it, were it not that the usually prolix directions of the French aurists lead them to think that the operation is one of difficulty.

A slight reference to the anatomical structure of the part will show that there can be no very great mystery in the operation. The opening of the Eustachian tube into the pharynx being about a quarter of an inch behind the soft palate, is placed on a line with the posterior end of the inferior turbinated bone. Its orifice is rounded or oval; is capable of receiving the tip of the little finger, and reposes against the side of the internal pterygoid process of the sphenoid bone. Its size, consequently, enables it to receive the point of the catheter prepared for this tube, with little or no difficulty.

In introducing the catheter, place the patient's head firmly against the back of a chair, and having oiled the end of the instrument, pass it through the nostril of the side affected, with its point resting on the floor of the nose, and with its convexity upwards, until it reaches the posterior nares and the rounded edge of the soft palate, which may be readily told by the patient's gaging. Then turn the point of the instrument outwards, towards the side affected, and it will generally slip into the orifice of the Eustachian tube (Fig. 218, B). As the operation, when employed in deafness, requires to be frequently repeated, it is well to mark upon the catheter the distance from the front of the nose to its point when introduced into the orifice, in order to facilitate its subsequent application. The injection of air, or of liquids, will, of course, depend upon circumstances.

# CHAPTER VIII.

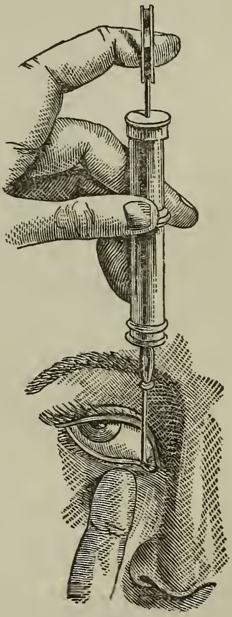
## INJECTIONS,

Or the introduction of liquids into the various passages of the body, are generally performed with a view to the relief of local derangement or to excite local action. They are used in the Lachrymal Ducts, the Urethra, the Vagina, Rectum, &c.

### INJECTION OF THE LACHRYMAL DUCTS,

With the view of removing inflammation, or an obstruction to the passage of the tears, is performed by means of a fine capillary pointed syringe, known as Anel's. In using it, hold the syringe between the thumb and middle-finger, with the fore-finger on the piston, so as to throw in the fluid, and standing either in front or behind the patient, according to the eye to be operated on, place the point of the syringe in the lower punctum, and introduce it only sufficiently far to prevent the escape of the liquid. Then, closing the punctum of the upper lid, throw in the fluid by moving the piston with the forefinger of the hand which holds the syringe, Fig. 231. If the liquid passes through the

*Fig.* 231.



duct to the nostril, its passage will be shown either by its escape from the nose in front, or behind, into the mouth of the patient. Simple water, or that containing a little astringent solution, is generally used where the object is to clear the passage and overcome the inflammation of the ductus ad nasum, and, when the syringe is properly employed, the injection of the puncta is a useful means of preventing the production of fistula lachrymalis.

Another plan, lately proposed, of cleansing this duct, is by the introduction of a catheter into the opening of the duct in the nostril, as in A, Fig. 218. Though comparatively simple, it is much more difficult than the plan just stated, and being opposed to the natural course of the tears and the anatomical structure of the part, is not generally resorted to.

As the capillary perforation of the point of the syringe would render it difficult to fill it when on the instrument, the point should always be made moveable, and only applied as a nozle to the syringe, after the latter is filled. Sometimes, when the puncta lachrymalia as well as the ducts are closed, it becomes necessary to dilate them previous to the use of the syringe. This may be done by a fine hair-like probe, also known as Anels's, or by the blunt end of a fine cambric needle, nicely rounded off and fastened in a light handle by its point. Slight strictures of the duct may also be overcome by introducing the needle into the puncta, and passing it as far as the sac, in the usual manner. On reaching this point, elevate the handle and pass the needle or probe in the course of the bony ductus ad nasum. Unless, however, the operator understands fully the anatomy of the part, he should be extremely cautious, lest he catch a fold of the lining membrane on the point of the instrument, and induce violent inflammation.

## INJECTION OF THE LUNGS

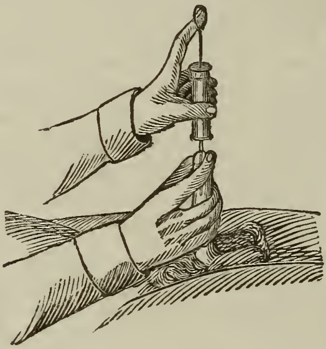
Is confined, of course, to the use of air, where the patient, from any circumstances, is incapable of carrying on his own respiration. In cases of asphyxia or drowning, especially the former, whether in adults or infants, it is often an operation of vital importance, and one which has consequently given rise to various plans and instruments for its performance. Being generally an act of great emergency, it is fortunate that the operator always has the best and simplest means about him, in the use of his own lungs. In order to inflate the lungs and keep up artificial respiration, let the operator place the thumb and forefinger of one hand closely around the patient's lips, and adjust his own mouth to it, whilst with the other hand he presses the pomum adami back against the vertebræ, so as to close the œsophagus, and prevent the passage of the air into the stomach. Then directing an assistant to compress the patient's nostril and to press upon his ribs whenever the lungs have been inflated by the breath of the operator, free the patient's mouth after each inflation; inflating and expelling the air, so as to imitate as much as possible the natural process of respiration. In cases of drowning, no time should be lost before commencing this operation, as it is generally the only chance that the individual has for life.

The injecting of air, &c., into the Eustachian tube, may be readily accomplished by attaching a syringe to the catheter, when introduced into the tube, as directed at page 406.

### INJECTIONS INTO THE URETHRA

Of the male are generally performed by the patients themselves. But as many are ignorant of the proper mode of performing them, and bring on inflammation by bruising the sides of the urethra upon the syringe, it is better for the practitioner to give them special directions in regard to the manner of employing them, or perform the operation himself once or twice, until the patient has learned the proper method of doing it. In order to use these injections properly, the patient should be directed to fill the syringe and insert its end gently within the urethra, closing the orifice around its point, as in Fig. 232. Then sitting down on the edge of a chair or bed, or upon a ball made by rolling up a handkerchief or stocking, so as to press upon the perineum, throw the fluid in by a motion of the piston, as in the figure, and, withdrawing the nozle, close the urethra quickly and hold the injection for a few minutes; then repeat the operation twice or three times as before. An attempt to urinate will evacuate the fluid without difficulty.

*Fig.* 232.



Injections between the prepuce and glans penis are often required in cases of phymosis. The only caution necessary to be given in these cases, is to prevent the patient from introducing the syringe into the orifice of the urethra, instead of beneath the prepuce.

### INJECTIONS INTO THE VAGINA,

Like those into the urethra of the male, are not often required to be performed by the practitioner; yet, owing to the ignorance of the patient, much of the benefit likely to result from their proper performance is lost. In the use of the ordinary female syringe, the patient should always be directed to lie down on her back, with the hips raised, and to retain the liquid used as long as possible, by pressing a cloth against the vulva. But wherever it can be done, the substitution of the French clyso-pompe, or self-injecting apparatus, should always be insisted on: as by using this instrument, a much larger amount of fluid can be thrown into the passage, and its whole surface more thoroughly acted on by it. The vaginal nozle of the self-injecting apparatus being placed on the tube and the patient seated over a basin, she can herself use a pint or more of any fluid for a considerable length of time, or, if necessary, by lieing down and arranging the instrument, have the syringe used by an assistant without exposure. In cases of leucorrhœa, &c., accompanied as it often is by extreme debility, this plan will be found highly serviceable.

### INJECTIONS INTO THE RECTUM,

Although generally performed by the nurse, yet occasionally fall to the lot of the practitioner, especially after operations in the neighbourhood of the part, and the comfort of the patient will be found to be much involved in their proper application. In France, these useful means of treatment are very frequently resorted to, whereas it is but seldom a patient can be persuaded to employ them in this country, owing, in a measure, perhaps, to prejudices, but also, as I have been often told, to the pain they cause. Now, if properly given, their use is productive of little or no pain, even in cases of hemorrhoids.

In order to give one without causing pain, oil the fore-finger of the left hand, and press its point gently against the sphincter ani muscle, till its contraction is overcome and the finger enters the gut. Then pass the nozle of the syringe, also well oiled, along the finger, as a director, till it also enters the gut, when, withdrawing the finger, the fluid can be thrown in without difficulty; care being taken to keep the point of the syringe in the line of the concavity of the sacrum. The position of the patient, and the liquid employed, must depend upon circumstances: but generally the patient is most comfortable lieing on the left side, with his back to the attendant.

# CHAPTER IX.

## EXTRACTION OF FOREIGN BODIES, &c.

UNDER this head, I propose to place a class of minor operations, which require very little division of tissue, yet involve the performance of duties which to be successful must be learned rather from practice and common sense than from detailed directions. I shall here, therefore, as in other points, be very brief in the details. In some of these operations, I also know that I trench upon the specific duties of those without the bounds of the profession; but as the practitioner may often supply their places, with great advantage to the public, it is deemed best not to pass them by.

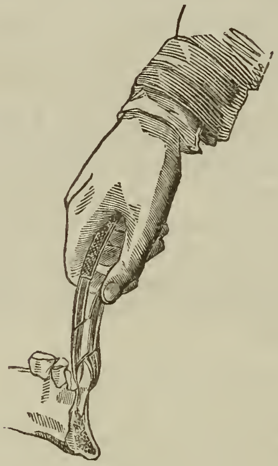
### EXTRACTION OF TEETH.

The operations upon the teeth being very generally performed by a particular class of persons, the physician is seldom consulted in regard to them, except when connected with other affections. Were it not then for these cases, and for the fact that in country practice the medical man is often the only one who can render assistance, I should omit them entirely: as beneath the position which a practitioner should hold in the estimation of the public. I shall, therefore, confine myself to Extraction.

The Extraction of teeth may be performed either with the Forceps or with the Key: the former being generally the preferable instrument. The instruments, as employed by dentists, are varied in number and shape, but for ordinary use the straight, curved, and hawk-bill forceps, are all that are necessary. As certain teeth require some little modifications of the general plan of operating, I shall treat of each respectively.

In extracting the *Incisors* and *Canine Teeth of the Upper Jaw*, the operator should grasp the straight forceps firmly, and seize the tooth just at its junction with the gums, taking care not to compress it with such force as to crush the crown of the tooth in the instrument. Then giving it a slight twist, so as to loosen the tooth in the alveolar process, pull it perpendicularly downwards and slightly backwards, in the direction of the alveolar cavity.

*Fig.* 233.

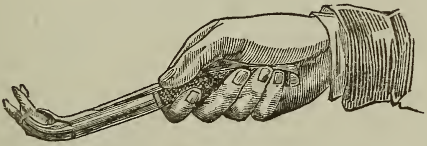


In extracting the *Bicuspid* and *Molar Teeth of the Upper Jaw*, use the hawk-bill forceps, or those especially made for the molar Teeth, and moving the tooth from side to side, pull perpendicularly downwards (Fig. 234).

The extraction of these teeth in the Lower Jaw is similar to those in the upper, except in the different direction required for their extraction, which common sense will render sufficiently apparent.

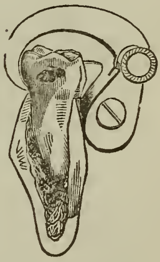
Many operators lance the gums previous to the application of the instrument to the tooth, especially in the molars and bicuspides; others, again, deny the necessity of it, except when the key is employed. It may, I think, safely be left to the judgment of the operator.

*Fig.* 234.



In extracting the *Molars* and *Bicuspides, with the Key of Garangeot*, or its modifications, wrap the fulcrum with some soft substance, in order to protect the soft parts from pressure. Then place the fulcrum on the *inside* of the jaw, so that the claw may embrace the tooth, just at its junction with the alveolar process (Fig. 235), and rotating quickly the handle of the instrument, draw the tooth from the socket. Should it not be freed entirely by these means, it must be seized by the forceps, and extracted as before mentioned.

*Fig.* 235.



For those who by practice have acquired the command of this instrument, it will be found to answer exceedingly well for the extraction of these teeth, or of stumps. Care, however, is required, lest the claw be placed upon the edge of the alveolar process, and the bone be thus fractured, as is occasionally done. If, through inattention, or owing to the seat of decay in the tooth, the fulcrum is not placed on the *inside* of the jaw, crushing of the alveolar process is very apt to follow, and special attention should be given to the action of the fulcrum, in such cases, in order to avoid it.

The extraction of *Stumps*, when not accomplished by the Key, requires the use of the Elevator, the point of which should be firmly thrust down between the stump and the socket. Then using the finger, a sound tooth, or the edge of the alveolar process, as a fulcrum, pry out the roots. But as the point of the elevator is exceedingly liable to slip and wound the cheek, the point of another finger, wrapped with cloth, should always be placed between the stump and cheek.

The excessive hemorrhage which sometimes follows the extraction of teeth, not unfrequently causes considerable trouble, although generally it may be arrested like that following leeching, by the use of nitrate of silver, or by a compress forced into the cavity, unless indeed it should arise from constitutional causes. A prescription recommended by Dr. Goddard, in his work on the teeth, is the following: — "Cause some alcohol to dissolve as much of the following substances as it is capable of doing, so that it may be a saturated tincture; namely, Secale Cornutum, and Gallic acid; then add about one-fourth of Creosote, by measure. This tincture may be applied by holding it to the part, or may be used to saturate the lint used in plugging the cavity, should that measure become necessary. Ergot, in the form of a watery solution, may, also, be used with success in many cases, as a gargle or mouth wash; especially when the hemorrhage comes from the gums."

Those practitoners who may be compelled to operate upon the teeth, will find much valuable, scientific, and practical information, in the work referred to.

## EXTRACTION OF CILIÆ.

In Trichiasis, or turning in of the eye-lashes, or in a supernumerary growth of the individual ciliæ, the the constant rubbing of the hairs against the delicate surface of the eye-ball, produces congestion of its vessels, and more or less serious inflammation; often indeed to such an extent as to impair the transparency of the cornea. Under these circumstances, the lids should be slightly everted, and their edges examined, so as to detect the seat of irritation, when the ciliæ may be pulled out by a pair of forceps, accurately adjusted at the points of the blades. But in obstinate cases, the most careful extraction of the lashes will not remedy the disease, because as long as the follicle remains in the lid the hair may be reproduced. Having then carefully removed the hair, the bulb or follicle should be thoroughly cauterized, by passing a piecee of nitrate of silver along the edge of the lid, or into the opening left by the extraction of the eye-lash.

## EXTRACTION OF FOREIGN BODIES FROM THE EYE-BALL.

Blacksmiths, and other workers in metals, not unfrequently suffer from sharp particles of foreign matter being driven into the eye-ball, so as to become firmly imbedded in its outer coats; thus producing a most painful affection. These little particles are also often so fine and brittle, as to render it impossible to extract them by forceps, and all such attempts not only fail, but render the matter infinitely worse, by breaking the piece. It will, therefore, frequently be found to be a better plan, to take a fine cataract needle, with a slight curve, and opening the lids widely, place the convex surface of the needle flat against the ball of the eye, and glide it gently over its surface. On reaching the piece the needle will generally draw it out, and cause it to fall upon the lid, or into the hand of the operator. But if this fail, the touch will indicate precisely the point of the particle, if it projects at all beyond the surface, and its extraction may then be eventually effected by repassing the edge of the needle against the foreign substance, and moving it downwards or upwards, according to the angle at which it projects, so as to shave or chip it out; an expression which I presume will not be misunderstood.

## EXTRACTION OF FOREIGN MATTER FROM THE EYE-LIDS.

From the constant use of locomotives as aids to rapid travelling, the introduction of sparks and particles of sand between the lids and the ball has become a common occurrence, and one frequently productive of considerable trouble; so much so, that the appointment of an eye-cleanser to such public conveyances would be a desideratum. When all simpler means have failed, and application is made to the surgeon, he should seize the edge of the lid with the fingers of one hand, and pressing the point of a pencil, or other round instrument, against its outside, evert the lid, so as to turn it completely inside out. Then, when its inner surface is thus exposed, wipe away the offending matter with a camel's hair pencil, a fine rag, or a piece of moistened soft sponge.

## EXTRACTION OF FOREIGN BODIES FROM THE NOSTRIL.

Coffee grains, pebbles, ribbon, &c., are occasionally introduced and become fastened in the nostrils of children; thus giving rise to violent inflammation and suffering, and causing considerable difficulty in their removal. With a proper knowledge, however, of the structure of the part, a scoop, or the curette of Leroy d'Etiolles, or polypus forceps, will generally suffice to accomplish the desired end. But if these fail, resort may be had to sternutatories, or to washing out the nostril with a syringe, and to the use of such means as will combat the inflammation.

## EXTRACTION OF FOREIGN BODIES FROM THE EAR

Is to be accomplished by somewhat similar means, although the operation here is by no means an easy one. When sufficient space exists between the sides of the external meatus and the foreign substance to permit the use of a syringe, a full stream of tepid water, thrown in whilst the ear is drawn upwards and backwards, will generally be found to answer for its removal; or even when the body fully fills up the meatus, a full stream forced against it will eventually wash it out by accumulating the liquid between it and the membrana tympani. In the use of the forceps, care must be taken not to force the substance further in. In case of insects, as earwigs, &c., which occasionally get in as far as the membrana tympani, and cause excruciating pain, the free use of warm olive or almond oil, by closing their pores, will generally produce their death, or cause them to seek the open air at the orifice: when subsequent syringing with tepid water will remove them. The use of landanum, and other stimulating articles, should be avoided, as they increase, instead of relieving the distress.

## EXTRACTION OF FOREIGN BODIES FROM THE THROAT

Is an operation which frequently affords the practitioner but little time to make his arrangements. It is desirable, therefore, that the instruments required should be made of such materials as can be readily obtained. Probangs, or rods of whalebone with a piece of sponge tied fast to one end; the handle of a riding-whip, the fingers of the operator, &c., are those therefore most frequently recommended. As the nature of the object swallowed may not, however, be such as to cause instant suffocation, but may, on the contrary, allow sufficient time to elapse for the development of inflammation, I would briefly allude to the rationale of the spasm and irritation, usually produced by bodies lodged in the pharynx.

In the North American Medical and Surgical Journal, for October, 1828, will be found an excellent article on this subject, by Dr. Henry Bond, of Philadelphia, from which I mainly condense these remarks. Dr. Bond states that foreign bodies are most frequently arrested so high in the fauces or pharynx that they may be seen, simply by depress- the tongue, and that in such cases, the finger or dressing forceps will suffice for its removal; whilst it is at this point they induce spasmodic action of the muscles of the glottis, by which the matter becomes impacted between the bones of the os hyoides and the top of the thyroid cartilage. This spasmodic closure of the glottis, produced by the irritation of the foreign body, induces spasmodic efforts of coughing, in order to throw it off. But the pressure upon the epiglottis preventing the inspiration necessary for coughing, suffocation ensues, unless the article is quickly removed. Now, in such cases, Dr. Bond recommends that the patient's head be held erect, and in such a manner as to make the chin project as little as possible beyond the pomum adami, so as to render the introduction of the finger more easy, and thus release the article from its position, so that it may readily be ejected. But where the objects are smaller, or where they descend further and pass the larynx, though the risk of suffocation is diminished, the difficulties of extraction are increased. For such cases, resort must be had to forceps, of which nothing can be better than the œsophagus forceps of Dr. Bond, which are now generally kept by the cutlers, and which every practitioner should possess. These forceps are twelve and a-half inches long, and curved to suit the shape of the throat, so that they will reach as far as the top of the sternum—a point, beyond which little difficulty is usually felt from foreign bodies.

The blades being bevelled off so as to avoid pinching the coats of the œsophagus, and serrated, are capable of seizing even small bodies, as a pin or fish-bone, without risk of injuring the passage. When coins, pieces of glass, or similar articles, are in question, the use of the forceps is decidedly the best way of removing them; but when these are not at hand, a piece of common wire, bent round and formed into a loop, with the free ends firmly twisted together, and the loop then bent into a hook, may supply their place, or in some instances supplant them. Dr. Bond makes several other excellent suggestions, but I must refer those desirous of learning them to the original article, as quoted.

## THE EXTRACTION OF FOREIGN BODIES FROM THE TRACHEA,

When not affected by coughing, cannot be readily accomplished by mechanical means, without making an incision into the anterior parietes of the tube; but sudden blows with the hand upon the cervical vertebræ, the use of sternutatories, or the efforts to cough induced by irritating the larynx with a feather, will occasionally suffice. Should the substance, however, so obstruct the passage as to threaten death, an incision one inch and a-half long, directly on the median line of the trachea should be made, so as to divide the integuments; the blood be thoroughly sponged off, and then two or three of the rings divided. The entrance of air through the opening will generally drive out the foreign substance. But, if it does not, a probe or director should be introduced through the wound, and the body pushed upwards.

Tracheotomy is, however, an operation of considerable danger, and I only call attention to it as thus performed in cases where, without it, certain death would ensue; it being, I think, a good rule to give every man a chance for his life, or to let him die of his doctor rather than from his disease; provided the latter point is certain.

## THE EXTRACTION OF FOREIGN MATTER FROM WOUNDS

Requires the use of forceps which are modified according to circumstances, and generally treated of in the works on Gun-shot Injuries. But when the substance is only particles of dirt, or such fine matter as cannot well be seized by the forceps, the free use of a stream of tepid water, either by means of a syringe or from a sponge, will suffice.

## THE EXTRACTION OF FOREIGN BODIES FROM THE RECTUM

May be accomplished by the use of a scoop or spoon handle, especially when employed with a speculum, and when the body is seated near the verge of the anus. But in the case of such substances as by their sharp projecting points would be likely to become imbeded in the side of the gut, the means employed by Marchetti in extracting the tail of a pig with stiff bristles from the rectum of a courtesan (as reported in Gibson's surgery), may be resorted to. This consists in the introduction into the rectum of a hollow reed, the end of the tail being passed through the reed so as to incase it: thus protecting the gut from the action of the sharp projecting points.

The recollection of this simple plan will, I think, enable any one to apply the principle to numerous other instances, both in the rectum and elsewhere. When glass pessaries, &c., become broken in the vagina, some such contrivance, which common ingenuity will readily suggest, would prove highly useful for its removal, without injuring the sides of the canal. For the removal of hardened fæces or ascarides, &c., either in adults or children, a salt or mustard-spoon, or the handle of a tea-spoon will be found to answer perfectly well.

## THE EXTRACTION OF FOREIGN BODIES FROM THE URETHRA

Embraces so much that is connected with the treatment of Calculus, that I must refer to the works upon Stone and Gravel, for the consideration of the means required.

## EXTRACTION OF CORNS.

Corns are a thickening of the Epidermis in consequence of pressure, and resemble a nail in shape; cause pain by pressure of the point on subjacent parts, and are generally treated by the public at large by filing, scraping, or cutting off the upper layer: which, by preventing the boot from pressing the central hardening upon the sensitive cutis vera, relieves the pain.

In the same way, the various corn plasters, &c., employed for their relief sometimes prove serviceable; that is, either by softening the induration and favouring its exfoliation, or by removing pressure.

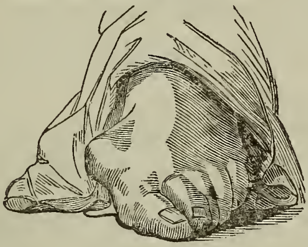
Now, without pretending to interfere with the business of certain Chiropodists, I would state two plans of treatment which the practitioner can employ with marked benefit. First, the corn plasters of Sir Astley Cooper. These consist of pieces of buckskin of the size of a ten-cent piece, spread with adhesive plaster, and having an opening in the centre of the size of the corn. This plaster being warmed, should be so placed that the corn will project through the opening, and if one piece is not thick enough to rise above the top of the corn, one or two more must be placed on top of it, until the corn being relieved from pressure ceases to act upon the true skin: thus removing the pain. The application of the pressure of the boot upon the circumference of the plaster, tends also rapidly to remove the corn, by forcing its central portion out through the opening.

But should more permanent relief be desired, the corn may be entirely removed by the following plan: Soak the foot thoroughly in warm water for an hour. Then with a small round-bellied scalpel, cut through the first layers of the hardened skin just on the edge of the healthy tissue. Seize the edge thus loosened with a pair of dissecting forceps and continue to dissect round the corn, on the edge of the healthy skin, but not cutting into it, till the pink cutis vera is reached, at the bottom of the little cavity thus made. Then, to ensure the entire destruction of the spot, touch the bottom with nitrate of silver, and thus prevent the re-appearance of the disease at this point. But if tight shoes continue to press upon the skin, new corns will inevitably be created. In this little operation no blood should be drawn, and relief will be afforded for a long period.

## EXTRACTION OF BUNNIONS.

When the anterior portion of the metatarsal bone of the big toe is subject to long-continued pressure, a bursal formation is induced, which, by its increase, creates severe and painful inflammation or even abscesses in the surrounding soft parts (Fig. 236).

*Fig.* 236.



These, like corns, may be cured, simply by removal of pressure. The use of Cooper's plaster, cut to fit the increased size of the tumour, will therefore prove serviceable. But when they produce more serious effects than mere pain, the only plan will be to excise the cyst by careful dissection and cauterization, guarding of course against any injury to the subjacent joint.

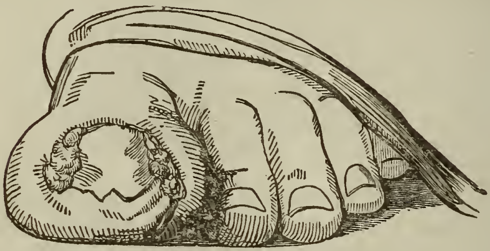
As connected with these parts, I must now refer to a small sore which is often productive of serious pain and inconvenience; has engaged the attention of surgeons for a long period, and called forth many proposed plans of cure. I refer to

## THE TOE NAIL ULCER,

Or that state of things which is induced by what is improperly termed the Inverted Toe Nail. This, as seated in the Big Toe, is usually the consequence of the pressure of the boot upon the inside of the toe, in consequence of which the skin on the opposite edge of the nail becomes bruised and inflamed. Or it may arise from the integuments being forced up over the nail, thus inducing inflammation, ulceration and the fungus represented in Fig. 237.

Various means have been proposed for the relief of this truly painful affection, in nearly all of which the nail has been treated as the "fons et origo" of the disease, and excision, eversion, cauterization, and numerous other equally agreeable means are highly lauded: all of which if effectual (and this seems doubtful) create a degree of pain which whilst it lasts is not surpassed by any other operation in surgery. Now all this, except in the worst cases, may be avoided by the following plan which I believe is due to Dr. Charles D. Meigs, of the Jefferson College of Philadelphia, and which I have several times found efficacious.

*Fig.* 237.



Scrape the nail or soften it in warm water so as to render it moderately flexible, and then introduce under its angle on the sore side, some soft lint or charpie, so as to fill entirely the space beneath its edge. Next apply a very small compress upon the granulations or tumefied or projecting integuments, in order to force them off the edge of the nail, and confine it there by a few turns of a little strip of adhesive plaster. The continued pressure of the compress, the action of the lint and the use of a loose shoe, will suffice for mild cases. But in more severe instances, the reduction of the surrounding inflammation, the removal of the granulations by nitrate of silver or excision, should precede the other means.

There are yet several operations likely to invite the daily attention of the young practitioner, but which cannot be classed under any particular head: To these I would now invite attention.

## OPERATION FOR TONGUE-TIE.

It not unfrequently happens, that parents who are over-anxious about the plumpness of infants, or especially desirous that they should be able to talk at an early period, most earnestly request a physician to examine the child's mouth, in order to ascertain "if the baby is not tongue tied." Now, if the child cannot elevate the front of the tongue, or protrude it beyond the lips, and sucks with a peculiar smack, it is highly probable that the natural freedom of the tongue does not exist, and though it is not a matter of serious consequence, yet attention to it will add to the comfort of all concerned.

Two defects of the frenum linguæ are usually found in such cases, one in which the frænum is naturally defective, and nearly beyond remedial measures during the year; the other in which the deficiency of motion is owing to the existence of a thin white membranous piece attached to the tongue in advance of the true frænum. This membrane is the most common cause of tongue-tie, and may be readily and safely removed as follows: Let the physician seat himself before a strong light, and place the child's head between his knees. Then let the nurse, sitting with her knees close to those of the physician, hold the child upon her lap, retaining a hold upon its hands with one of her hands, and depressing its lower lip with the other.

The practitioner now introducing the first and second fingers of the left hand beneath the point of the tongue, so as to place the frænum between them, can, with a gum or thumb lancet, easily nick the anterior edge of the membranous frænum, and by elevating the tongue cause it to yield to the pressure of his fingers. This little operation usually causes only a drop or two of blood, unless by ignorance or carelessness the sub-lingual vessels should be opened. After this, the child will be able to suck with perfect freedom.

## LANCING THE GUMS.

This extremely simple operation, though of daily occurrence, has not unfrequently proved quite a source of agitation to the young operator. It may readily be performed by placing the child in the position just described, and then with a gum lancet or sharp penknife, cutting through the gum, down to the tooth, in the direction of the width of the latter. The incisors will therefore require to be lanced directly in the middle of the gum, but the molars will demand a crucial incision, in order to free the entire crown of the tooth. Lancing should not, however, be practised until the gum is sufficiently swelled to prove painful, and the position of the tooth be thus plainly indicated; but when it is done, it should be done freely, that is, until the tooth is distinctly felt with the point of the lancet.

## PROLAPSUS ANI.

The protrusion of the Rectum as a consequence of Dysentery, Diarrhœa, &c., is generally relieved by the manual efforts of the attendant. But it occasionally happens, that owing to congestion of the vessel from long-continued protrusion, or extreme relaxation of the sphincter ani, the aid of the physician will be demanded. Under such circumstances, it will be found highly advantageous to wash the part with cold water, or if there is congestion or inflammation, to foment it for twenty minutes with cold cloths, previous to attempting the reduction. After which, let the practitioner oil the first finger, or the first two fingers of each hand, and pressing directly on the centre of the tumour, endeavour by gentle manipulation to push the folds of the bowel one after another within the sphincter ani; after which, if the muscle contracts, nothing more is requisite. But if it has not sufficient power to retain the replaced parts, an advantage will be gained by the use of a compress applied to the anus, and retained by a T bandage.

## REDUCTION OF HERNIÆ.

Taxis, or the reducing of hernial protrusions by the pressure of the fingers, is very often so simple an operation, that patients are able to accomplish it themselves; but it also occasionally happens that it becomes a most important affair, the life of the patient depending on its early performance. In cases of genuine strangulation, in which there is usually the greatest difficulty in performing the reduction, there is usually such great necessity for surgical skill, that the general practitioner will do well to consult a surgeon at the earliest moment. But in the simpler cases, he may make the taxis successfully, by placing the patient upon his back, with the thighs drawn up and the shoulders elevated, kneading the tumour by his fingers with great gentleness in the direction of that canal through which the bowel has protruded; after which, a well-fitting truss should be employed to retain it in the abdomen. The importance of having this truss well adjusted is a matter of some moment, and its application should, I think, be confined mainly to the operating surgeon. The practitioner will, therefore, as a general rule, do better by turning the case over to one of greater operative skill than he, from his limited opportunities, will usually possess.

## CLUB FOOT.

The prevalence of this deformity in many sections of the country, and the length of time generally necessary to accomplish a cure, has generally caused these cases to be much neglected by practitioners. Every physician should, however, endeavour to make himself sufficiently master of this class of complaints to treat them during the earlier months of infancy, by which means he will save time, and prepare the case for such measures as the surgeon may subsequently be called on to pursue. The mechanical means being very simple, may easily be employed by any practitioner; but before showing those which are requisite in the majority of cases, I would very briefly state a few anatomical points closely connected with the treatment, which should always be borne in mind by those applying the different kinds of apparatus.

Club foot, as a congenital deformity, consists in a departure of the articulating surfaces of the various bones of the tarsus from their natural relations, in consequence of irregular muscular action. It must, therefore, be recollected, that no matter in what direction the foot is turned, one set of muscles are spasmodically contracted, and the others more or less weakened, or partially paralysed, by continued extension. The articulating surfaces of the tarsal bones being also often considerably separated from each other by malposition, it follows that even when the foot is placed in its proper relations to the leg, a long period must elapse before the elongated ligaments will contract to a proper length; or the articulating surfaces of the bones be modified; or before muscles, more or less wasted by extension, will again be capable of resisting the contractions of the set which produced the deformity. The sooner, therefore, the treatment is commenced after the month, the greater will be the chances of success.

Out of a very considerable number of cases that have fallen within my observation, few have been cured under periods of several years. By cured, I mean, placed in such a condition, that when running about for three or six months with ordinary shoes the feet will show no tendency to return to their unnatural position. Very many cures, I am aware, have been reported in extremely short periods; but this only shows that opinions differ widely as to what constitutes a cure. In my opinion, no case is cured unless it will stand the test of six months exercise without a boot. The rule I pursue, therefore, in every case, is to tell the parent that the child, no matter how young, will probably have to wear a stiff shoe of some kind, until eighteen or twenty years of age, or until the osseous system is fully developed.

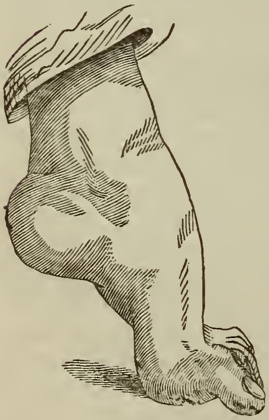
Having known many practitioners misled in this matter by inconsiderate statements of results, and wishing to prevent misapprehension on a point of great practical importance, I repeat the opinion that most patients will be liable to a return of the deformity, unless the mechanical means are long continued, and unless a shoe of more than ordinary stiffness is worn until the bones of the foot are fully developed, even when the foot appears to be perfectly straight when removed from the splints.

The division of tendons, though a simple operation, has not been, in my observations, essential to a cure. The operation I have found to facilitate the use of mechanical means, in consequence of its reducing the amount of resistance to the action of the shoe, and thus saving the integuments from a degree of pressure that might result in excoriation or sloughing; but mechanical means, carefully used, are capable of accomplishing the same result without an operation. In the treatment of club-foot, each variety will usually require some modification of apparatus; but, as after treating the two most common varieties, such modifications can be readily made by any physician, I shall limit this account to these forms of the complaint, rendering the details of the pathology, &c., as brief as possible. The simplest form of Club-foot is

## PES EQUINUS.

In this variety, the heel is elevated by the contraction of the gastrocnemius, soleus, &c., and the patient, if allowed to walk, will rest his weight, with some slight modifications, mainly on the Metatarso-Phalangial articulations. In the young infant, the ends of the toes present perpendicularly downwards, the instep appears to be almost a direct continuation of the leg, and the sole of the foot is nearly on a line with the calf. In this variety, owing to the elevation of the heel, the astragalus presents prominently forwards, and the scaphoid and cuboid, in consequence of the elongation of the dorsal ligaments, also fall forwards; thus giving to the foot a strongly-marked arch, the centre of which is about the cuneiform bones. The sole of the foot in the young infant is frequently quite flat,

*Fig.* 238.



but in children who have walked, and especially in adults, it is more or less concave, in consequence of the contraction of the short flexors of the foot, as well as of the plantar fascia.

Bearing in mind the extreme fineness of the skin in young children, and its liability to inflame from even moderate pressure, the practitioner who is about to treat club foot, should commence at the earliest possible period after the month, by manipulating the foot, calf, &c., so as to favour a change of position, and, at the same time, instruct the mother or nurse how to carry out the subsequent treatment.

In order to harden the skin, he may commence by soaking the foot for fifteen minutes in a decoction of white oak bark; which will prove most serviceable if employed cold or cool. Then, after a few days, let him commence his manipulations by placing his four fingers on the instep, and his thumb beneath the ball of the foot, and endeavour to bend the foot at the ankle; making friction at the same time upon the calf of the leg, in order to favour relaxation of the contracted muscles. By a judicious perseverance in such motions, considerable change can be effected in the parts before a child is six months old; after which, strips of muslin drawn from the foot up to the knee, or adhesive strips made fast around a kid sock, and then around a bandage above the calf, will prove serviceable.

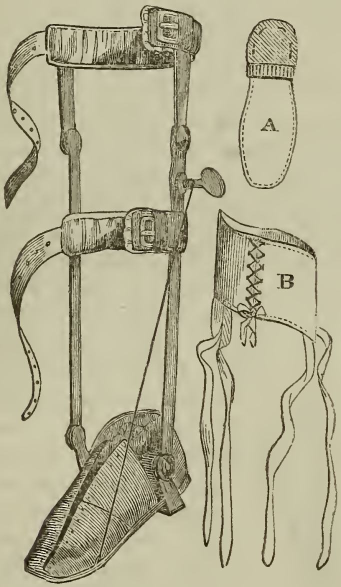
As soon as the skin seems tough enough to sustain moderate pressure, and this of course will vary somewhat in different children, a regular club-foot shoe may be resorted to. I am generally able to apply a light shoe between the ninth and twelfth month, taking care at first merely to apply it in the natural position of the foot, and waiting a few days until the child becomes accustomed to the restraint. After this, say about the end of the tenth month, in a large child, the mechanical treatment, hereafter detailed, may be commenced. Should there, however, have been any marked difficulty in the extension of the foot by the hand, it will facilitate the treatment to divide the tendo-achillis. This may be readily done as follows: Pick up a fold of the skin over the tendon, about one inch above the extremity of the os calcis, and introduce a sharp-pointed penknife blade into the fold, with its blade flat beneath the skin. Pass it on beneath the skin, until it is directly over the tendon, but do not let the point perforate the integuments on the opposite side to that where it entered. Next, turn the blade so that the cutting edge will present to the tendon, and hold it firm. Then extending the foot, cause the tense tendon to bear against the blade of the knife, when the division of the tendon will be readily effected. Turning the knife again upon its side, withdraw it at the point of entrance; close the little puncture immediately with the finger, to prevent the entrance of air, and apply over the wound a morcel of adhesive plaster. The tendon being thus divided, the limb should be left in its natural condition from five to seven days, during which time the divided edges of the tendon will reunite by a new matter, which being readily extensible, will favour the elongation of the contracted muscle. After which mechanical means will effect the cure.

Although this operation facilitates the cure by diminishing the resistance, and saving the skin from a certain amount of pressure, yet it is by no means always necessary. The penknife referred to in the operation, if stiff in the spring, will answer every purpose in the division of this tendon; but if deemed too common an instrument, a similarly shaped blade, made a little longer and fastened firmly to a handle, may be used, and called a "Tenotome."

Either with or without the division of the tendo-achillis, the following mechanical means, shown in Fig. 239, will be necessary to accomplish the cure.

This apparatus being a slight modification of the shoe of Scarpa, may be readily obtained of the cutlers, and is designated as an "Adjusting Shoe."

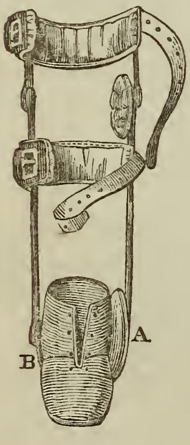
*Fig.* 239.



The sole is made of sheet iron, and has four holes or fenestra in the heel, as seen at A, these fenestra being intended for the passage of the tapes of the gaiter B. The remaining portion of the cut explains itself.

In using this apparatus, after having it made to fit the limb of the child, and after having pursued the preliminary treatment until the tenth or twelfth month, the practitioner should proceed as follows: Apply a gaiter, made of the softest buckskin, directly at the ankle without the intervention of wadding, and lace it moderately tight. Next, apply the splints upon the back part of the limb; place the foot in the shoe (applying a piece of kid, &c., to the inside of the sole of the shoe to prevent chafing), and then drawing the tapes of the gaiter through the holes shown at A, tie them beneath the sole, so as to bring the heel of the foot directly in contact with the heel of the shoe. Then lacing up the shoe, buckle the strap around the leg, and also that about the thigh, and see that the angle of the shoe and leg correspond with the *natural* position of the foot. The shoe, thus applied, should be worn for an hour in the morning, and again applied for an hour in the afternoon, until the limb becomes accustomed to it, and the child will bear a slight flexion of the foot. To effect this, turn the screw on the side of the instrument a little, from day to day, so as to elevate the toes and bring down the heel, and thus gradually elongate the contracted muscle.

*Fig.* 240.



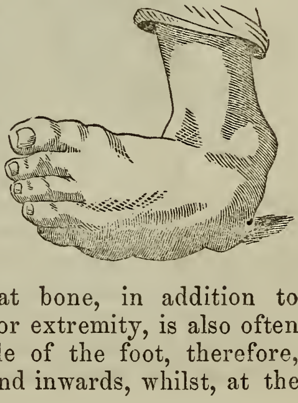
To bring the foot to its proper position, that is, so that the child can place the sole flat upon the ground, will generally occupy from three to six weeks, after which, the adjusting shoe may be removed from the splints, and an ordinary leather shoe substituted. But it is perhaps better, in order to prevent chafing at the knee and ankle-joints in walking, to substitute an apparatus like that in Fig. 240.

This, to ensure a cure, should be worn by the patient for several years after he is able to run about, in order to give time for the remodelling of the bones and ligaments, as the little patient grows.

In thus defining the periods required for the different steps of the treatment, nothing more than an average can be offered. My experience has, however, convinced me, that the time usually assigned for the treatment of club foot, and especially for a radical cure, is too short, unless no account is taken by the surgeon of the measures pursued by the parents after the earlier periods of his treatment. A practitioner may understand, that when a case of club foot is placed in such a condition that the patient can walk about with the apparatus on, without showing any great deformity, it may be called a cure; but the parent who finds the feet disposed to return to their original deformed state, as soon as they are removed from the shoes, and who is compelled to furnish such shoes and splints for a dozen or more years, will have a different idea of the case. The physician will, therefore, act wisely, who explains these circumstances to the parent before commencing the treatment.

## VARUS.

*Fig.* 241.



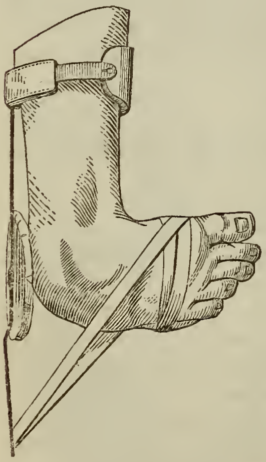
In Varus, or that form of club foot in which the foot is bent inwards, a more complicated deformity is found than that which exists in Pes Equinus. In this variety, the metatarsal bones are bent inwards at varying angles with those of the last row of the tarsus. The tarsal bones, especially the cuboid, are also more or less twisted upon the calcis, and that bone, in addition to the elevation of its posterior extremity, is also often rotated inwards. The sole of the foot, therefore, looks obliquely upwards and inwards, whilst, at the same time, the distance between the heel and toes is considerably diminished (Fig. 241.)

Should the child have walked, the cuboid bone will show signs of having sustained the greater portion of the weight, and there will usually be a callous lump on the integuments, as the result of this pressure.

Of the particular changes in the dorsal and plantar ligaments, and in the muscles and tendons, I can here say little, as the description would extend my remarks beyond what seems necessary for a treatise like the present. Those who may wish details, will find them in most of the modern works on surgery.

Varus, or rather varus combined with pes equinus, is the form of club foot that is most frequently seen in infants. It is also the variety that most seriously demands early attention on the part of the practitioner. If possible, therefore, the child should not be allowed to bear any weight on its foot until the deformity has at least been reduced to simple Pes Equinus. In the young infant, say within three months, this inward displacement may by caution and perseverance be certainly overcome. The simplest means that I know of will be found in the following: Apply on the outside of the leg a straight splint, similar to that seen in Fig. 242, and pass around the metatarso-phalangial joints a few turns of bandage, ribbon, or similar article, carrying each turn around the lower end of the splint, or through its fenestrum, as seen in the figure. By tightening

*Fig.* 242.



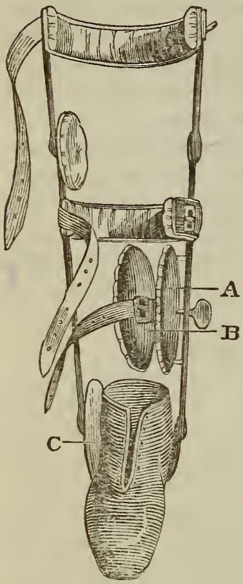
this band from day to day, and by such manipulation as has been described under the head of Pes Equinus (except that the endeavour should here be, simply to bring the toes into the line of the foot, and not to meddle with the heel until the case is converted into Pes Equinus), success will be readily obtained; simple straightening of the toes being alone attempted. When the outside of the toes can be made to touch the splint and remain there without the use of much force, the case should be treated precisely as if it had originally been of the first variety that I have mentioned, that is, of Pes Equinus. Occasionally, the division of a tense tendon, or of a very tense band of fascia, may facilitate the cure; but, not unfrequently, if the child is attended to within the period mentioned, the maneuvres just detailed will prove sufficient.

## BANDY LEGS, OR BENT BONES.

This unsightly condition of the bones of the leg requires but little explanation. It is most frequently the result of placing heavy children upon their feet, before the tibia is sufficiently ossified to sustain their weight. Besides the unsightly character of the deformity, this curving of the tibia is apt to interfere with very active progression, and as it can be remedied by simple means, provided they are persevered in, the case is one which should receive early attention. The principles of the treatment are to remove or diminish the weight sustained by the tibia, and then by gentle pressure to restore the pliant bone to its straight condition. Although nature may accomplish these results unaided, any simple apparatus, acting on the principles just detailed, will aid materially in the cure. One similar to Fig. 243 is all that I have found necessary in most cases. It resembles the shoe in which children having club foot usually walk (as before detailed);

but in addition, it has two padded pieces or splints of sheet iron, as at A and B, which fasten around the limb, on the opposite side and on the front of the curvature. By moving every week the screw attached to A, such a gradual pressure can be made at the point of greatest convexity, as will bring the bone into its proper line. The upper straps in the figure assist in supporting the weight of the body, the greater part of it being sustained by the side steel splints instead of by the tibia. As the development of the osseous system is rapid at this period of life, a cure can generally be effected in a few months.

*Fig.* 243.



Much of the success attendant on the treatment of the deformities that I have now referred to, will depend on the character of the apparatus employed. Each case will require its own instruments, and they must be changed in accordance with the growth of the patient. For the information of those who cannot obtain proper shoes and splints in their own locality, I would mention that John Rohrer & Son, Sixth street below Arch street, Philadelphia, keep and manufacture a very large assortment for all kinds of deformities.

## INSERTION OF GLASS EYES.

When, from any cause, the ball of the eye has been injured and vision destroyed, it is often desirable to conceal the deformity by the use of a Glass Eye. This consists in a section of a sphere of glass accurately coloured to suit the different appearances of the human eye, and intended to be placed in front of the remains of the injured ball, where the pressure of the eyelids retain it, and where the action of the stump, or remains of the eye, gives it motion. So perfectly is this sometimes the case, that unprofessional observers have not been able to tell a glass eye from the sound one.

These eyes are now imported in considerable numbers and at moderate prices by Bauersach, Market Street, Philadelphia; Milhaud, Broadway, New York, &c.: and as their insersion is very simple, it is to be hoped that the Profession will more frequently employ them to conceal deformities, which are often a constant source of mortification to the patient. By inserting them personally, they will do away with the advantages now reaped by charlatans, at their expense.

*Introduction.*—After having selected an eye of the color, size of pupil, and prominence of ball, that is desired, seize it between the thumb and fore-finger of the right hand, and dip it into a glass of tepid water. Then elevate the upper eyelid by the thumb of the left hand, and sliding the glass eye under its edge, let the lid fall gently upon it. Next, depress the lower lid by the middle finger of the left hand, and slip the false eye within it: when the subsequent action of the lids will retain it in its place, and give the proper central position in the orbit.

In order to remove the eye, take a bodkin, or short probe, and depressing the lower lid, slip its triangular end between the lid and the ball and slightly under the edge of the glass eye. Then depressing the other extremity of the probe on the cheek, so as to make it act as a lever, catch the eye with the left hand, or with a handkerchief held to receive it. After its removal, cleanse it in a little water; dry it thoroughly and put it away in soft cotton in order to preserve an equal temperature, till it is again wanted. Want of attention to the changes of temperature is a frequent cause of the cracks so often complained of in these eyes. Being very brittle, the change from the warmth of the cavity of the orbit, to a glass of cold water, will be sufficient to break them.

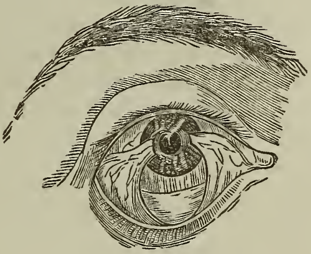
The movements required for the introduction and removal of these eyes are so simple, that patients readily perform them for themselves. At first the glass eye should only be worn three or four hours, lest it produce inflammation of the ball on which it is placed: but afterwards it may be worn for any length of time.

In the selection of eyes, care should be taken to see that they are perfectly smooth on the edges, as otherwise they will irritate the ball. But I do not think it always necessary to use first a small eye and then another, during several weeks, in order as is said, to dilate the lids, unless we wish, as eye doctors do, to mistify the patient with the difficulty of the operation. Should the ball continue to waste away, then a larger eye will of course be demanded.

## EXCISION OF THE PTERYGIUM.

When the vessels of the conjunctiva become permanently enlarged, a thickening of the membrane and of the sub-conjunctival cellular substance results, which by extending over the cornea, interferes with vision. This diseased portion is usually of a triangular form, and commencing at the inner canthus of the eye, gradually diminishes in breadth, till it terminates by a sharp apex, somewhere on the edge of the cornea. Though generally single, we occasionally find more than one (Fig. 244), and in such cases their continued growth soon destroys the patient's sight. When the prolongation of a pterygium seems likely to extend to the pupil, and to interfere with vision, it should be operated on. This may be done, either by seizing the enlarged conjunctiva with a pair of fine forceps, or with a hook. Then drawing it off from the sclerotic coat, cut out the central portion, with its vessels, by a snip of the scissors: cutting from the cornea towards the internal canthus of the eye, and taking care not to include the plica semilunaris. Or if the base of the pterygium is not very wide, make a simple transverse incision through it, down to the sclerotica, at a point half-way between the internal canthus and the edge of the cornea, so as to divide entirely the vessels supplying the growth. Then pass a sharp-pointed stick of nitrate of silver in the line of the incision, and cauterize its edges; so that the circulation being destroyed in the part, the enlarged membrane may shrivel away.

*Fig.* 244.



## ON THE CATOPTRIC EXAMINATION OF THE EYE AS A MEANS OF DIAGNOSIS IN CATARACT.

The difficulty of distinguishing Cataract from Amaurosis is not unfrequently experienced even by the surgeon of extended experience. That the general practitioner should, therefore, occasionally cause a patient to take a long journey to be relieved surgically of a Cataract which does not exist, is not surprising, and this valuable diagnostic sign, if it does not entirely prevent this error of diagnosis, will certainly prove a great security against it.

The following account modified from Rankin's Abstract for July, 1845, and from Lawrence on the Eye, by Hays, will explain the proceedings:

In 1836, Sanson, of Paris, observed that if a light was placed before the eye of a person afflicted with amaurosis, the pupil having been previously dilated, three images would be perceived; the first, anterior, the brightest, being erect; the second, central, somewhat paler, inverted; and the third, posterior, the palest of the three, but like the first erect. The first is formed by the cornea; the second by the front of the lens, and the third by its posterior segment. The production of these images is thus explained by the ordinary laws of optics. In every mirror, the image formed by a convex reflecting surface always appears behind it, erect and smaller than the object it represents; but images formed by a concave reflecting surface, when the image is placed further from it than its principal focus, appear before it, inverted and diminished. The reflections from the cornea and anterior portion of the lens, being convex mirrors, are erect; that from the anterior face of the posterior segments of the lens, being concave, is in accordance with these laws, in advance of the surface, and and inverted. If a lighted candle, therefore, is held before the eye, three reflections of it become visible, viz., two upright, and one inverted; being those from the cornea and front of the lens, upright, and that from the posterior face of the lens, inverted.

Opacity of the cornea destroys all three images by preventing the transmission of the light; opacity of the anterior portion of the capsule destroys one inverted and one upright image, that is, both those formed by the lens; whilst opacity of the posterior portion of the capsule destroys the inverted image, but leaves the two upright, thus indicating very positively the seat of the disease.

Certain precautions are, however, to be observed, in order to secure success:—1st. The pupil must be dilated to double or treble its ordinary size, and this may be almost instantly effected by dropping into the eye a solution of atropine, grs. j., water, ʒiij., the lids being immediately closed, so as to prevent the escape of the solution with the tears which it excites. 2d. The eye must be examined in a dark room by means of a clear and steady burning lamp or candle. 3d. The observer should be seated in front of the patient, so that he may look down into the eye rather than up. 4th. After finding the image as formed by the cornea, being the usual reflection of an image seen upon any eye, under ordinary circumstances, the observer if looking in a direct but obliquely transverse line from this image, will notice the erect but paler image of the front of the lens, and lastly, and partly between the two, the small inverted image of the posterior face of the lens. If these images are not readily seen, he should move the light slowly from side to side, until he seizes them, and to appreciate the effects of the test in cases of disease, practice the experiment first upon the healthy eye. These precautions being taken, the three images will certainly be present if cataract does not exist; unless it be so slightly developed as merely to constitute a very slight haziness, which, therefore, permits the transmission of light, or is situated at the circumference of the lens where it cannot prevent the reflection from its centre, the latter being readily detected by noticing that the images become faint, or disappear at this point.

When these three images are seen, there can be no disease of the cornea, or anterior or posterior face of the lens or capsule. The absence of any one will, therefore, indicate the surface affected. In amaurosis, all three of the images are seen; in perfect cataract, only that formed on the cornea.

## EXCISION OF THE UVULA

Is frequently rendered necessary, in consequence of the elongation of the extremity of its mucous membrane, which falling upon the posterior portion of the tongue and pharynx, or even in some instances into the glottis, or upon the epiglottis, keeps up a constant tickling, which induces so much coughing, and copious expectoration, as to similate the commencement of phthisis pulmonalis. As this elongation is at first merely the result of a slight œdema of the mucous membrane, resulting from inflammation, common astringent gargles of oak bark, powdered galls, tannic acid, powdered alum, tinct. ferri chloridi, nitrate of silver, &c., may reduce it. But if, when free from inflammation, it continues permanently elongated, its removal by the knife becomes necessary. This may be readily effected by seizing the point of the uvula with a pair of dressing forceps, and clipping off merely the tip, with a bistoury or a pair of blunt-pointed scissors; care being taken not to cut off so much of the point as to involve the muscle, lest, by destroying the action of the part, we should impair the voice. This operation causes little or no pain, is quickly done, and requires no further after-treatment than the use of a gargle of cold water or of some mild demulcent, as gum arabic or slippery elm, from time to time, with attention to diet.

## EXCISION OF THE TONSILS.

In consequence of the chronic enlargement and induration of these glands, their excision is often required, in order to relieve the irritation of the throat, and the effects upon the voice and respiration which they produce. Two means were formerly recommended for their removal, to wit, the ligature and excision; but one only is now generally resorted to, and I shall, therefore, confine my remarks to *Excision.*

When all acute inflammation is removed, and the means of scarification, touching with tincture of iodine, &c., have failed, the upper portion of the gland, or that next to the velum pendulum palati, should be removed. Of the various instruments employed for this purpose, the modification by Schively, of Dr. Physick's instrument (Fig. 245), will, I think, be found to be the most convenient and safe. Fahnestock's instrument, although a good one in some respects, is objectionable from the difficulty attendant on sharpening a circular knife, and also from its manufacture having been patented. With either, however, the operation is simple, and performed as follows: Seat the patient on a moderately low chair, and direct the assistant supporting the head, to place his fingers

*Fig.* 245.

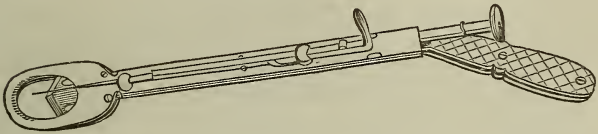
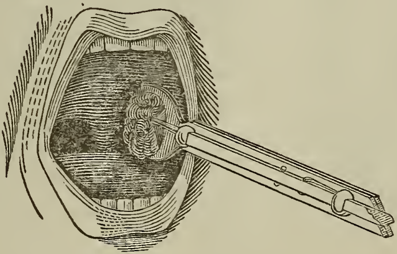


*Fig.* 246.



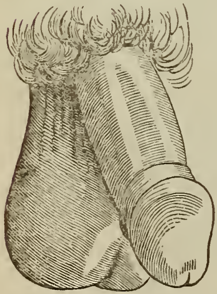
beneath the angle of the patient's jaw, so as to force the gland into the throat, and render it more prominent in the pharynx. Then, whilst the mouth is widely opened, pass the instrument into the throat, with its flat surface parellel with the tongue, and on reaching the gland, turn the handle up, so as to include the tumour in the ring of the instrument: when a rapid movement of the concealed knife clips off the portion coming within its range. This is sometimes brought out by the withdrawal of the instrument, or is spit out by the patient (Fig. 246).

In this operation, I would advise the young practitioner not to be too anxious about the size of the piece to be removed: as the excision of the projecting third of the gland will generally be followed by the absorption of the remainder, and is all that is necessary.

## REDUCTION OF PARAPHYMOSIS.

When, in children or adults, a rather narrow prepuce is forcibly retracted, it will sometimes produce such a constriction of the parts adjacent to the corona glandis as to develop severe inflammation, and possibly induce gangrene.

*Fig.* 247.



To obviate this, as well as to relieve the sufferings of the patient, the physician should at once attempt to restore the parts to their natural condition.

If serum has been effused beneath the mucous coat of the prepuce, and the parts have become puffy and swollen (Fig. 247), he should first evacuate it by numerous small and superficial punctures with the point of a lancet, and then, after holding the penis for a few minutes in very cold water, seize the body of the organ behind the corona, between the first and second fingers of each hand. Next, whilst gently drawing the prepuce forward with the fingers, force or knead the head of the penis backwards with the thumbs, or if one hand has seized the constricted part, press back the end of the penis with the fingers of the other, in the same way that any one would endeavour to invert the finger of a glove.

After its reduction, simple cold bathing of the part is all that is requisite.

I have now treated of most of the minor operations of surgery, or of such as do not involve an extensive division of tissue, and are likely to fall to the daily lot of most practitioners: excepting, perhaps, a few upon the organs of generation, such as stricture, phymosis. As it would be difficult to refer to these in the brief manner that has been laid down as the plan of this work, without doing injustice to the subject, or perhaps causing injury to the patient, I feel compelled to pass them by.

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